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NATIONAL DAM INSPECTION PROGRAM. BRYANT POND DAM (NDI I.D. NUMB--ETC(U)
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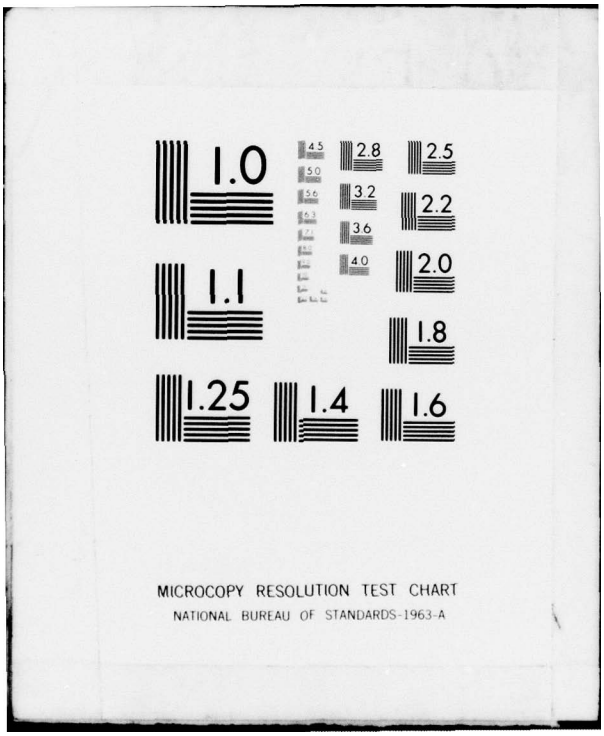
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(6) National Dam Inspection Program.
Bryant Pond Dam

(1)

SUSQUEHANNA RIVER BASIN,
HARVEYS CREEK, LUZERNE COUNTY,
PENNSYLVANIA.

Phase I Inspection Report,

LEVEL II

BRYANT POND DAM
NDI I.D. Number PA-00544
DER I.D. Number 40-11,
ESTATE OF GLENDORA BRYANT

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

(10) Prepared by Frederick/Futchko

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For

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

(12) 120

(11) JULY 1979

(15) DACW31-79-C-0015

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

SUSQUEHANNA RIVER BASIN

HARVEYS CREEK, LUZERNE COUNTY

PENNSYLVANIA

BRYANT POND DAM

NDI ID No. PA-00544
DER ID No. 40-11

ESTATE OF GLENDORA BRYANT

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

JULY 1979

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NATIONAL DAM INSPECTION PROGRAM

BRIEF ASSESSMENT OF GENERAL CONDITION

AND

RECOMMENDED ACTION

Name of Dam:	Bryant Pond NDI ID No. PA-00544/DER ID No. 40-11
Owner:	Estate of Glendora Bryant
State Located:	Pennsylvania
County Located:	Luzerne
Stream:	Harveys Creek
Date of Inspection:	11 June 1979
Inspection Team:	Gannett Fleming Corddry and Carpenter, Inc. Consulting Engineers P.O. Box 1963 Harrisburg, Pennsylvania 17105

Based on visual inspection, available records, calculations, and past operational performance, Bryant Pond Dam is in very poor condition and is judged to be unsafe, emergency. With existing conditions, the spillway will pass only 2 percent of the PMF without overtopping the dam. A failure of the dam will increase the hazard to loss of life at one recently constructed home downstream. The spillway capacity is rated as seriously inadequate. The embankment has been overtopped twice in its operational history.

Furthermore, excessive settlement has occurred on the embankment, especially on the downstream rockfill, over its entire operational history. This has contributed to the breaking of the concrete core-wall. At present, the core-wall is broken and tilted over the entire length of the dam, except where the dam was breached and subsequently repaired. As the core-wall cannot be relied upon to be effective, the embankment is considered to be beyond repair.

The attempted repairs by the Owner were not designed or made in accordance with good engineering practice and are inadequate. The repairs to the breach area are unsafe.

The outlet works is considered to be beyond repair. There is no means of drawing down the reservoir.

Representatives of the Corps of Engineers visited the damsite on 14 June, 1979. A telegram was sent to the Governor of the Commonwealth on 19 June, 1979 informing him of the unsafe conditions at the dam and recommending that the dam be breached.

The following measure is recommended to be undertaken by the Owner immediately:

(1) Draw down the reservoir and then breach the dam. The breach should be of sufficient size that it is not possible to impound any significant quantity of water behind the dam during a flood. The method of breaching should be in accordance with good engineering practice. The breaching should be performed under the supervision of a professional engineer and it should be carefully accomplished by an experienced contractor to avoid creating a hazard downstream. Any structure that might replace the existing dam should be

considered a new structure by the Commonwealth. Due consideration of the poor performance history of the existing features of the dam should be given before an attempt is made to incorporate them into a new structure.

Submitted by:

GANNETT FLEMING CORDDRY
AND CARPENTER, INC.

Frederick Futchko
Project Manager, Dam Section

Date: 7 August 1979

Approved by:

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF
ENGINEERS

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

DATE: 23 August 1979

BRYANT POND DAM

Overview

SUSQUEHANNA RIVER BASIN

HARVEYS CREEK, LUZERNE COUNTY

PENNSYLVANIA

BRYANT POND DAM

NDI ID No. PA-00544
DER ID No. 40-11

ESTATE OF GLENDORA BRYANT

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

JULY 1979

SECTION 1

PROJECT INFORMATION

1.1 General.

a. Authority. The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Bryant Pond Dam is an earthfill and rockfill dam with a concrete core-wall. The earthfill extends along the upstream side of the core-wall and the rockfill extends along the downstream side. The dam, including the main and auxiliary spillways, is CONT

425 feet long. The design height is 19 feet. The main spillway is located near the left abutment of the dam. It is a series of concrete slabs forming a cascade to the natural stream. Other than its exterior lines and grades, details of the main spillway are unknown. The main spillway crest is 40 feet long and 5 feet below the design top of the dam. The auxiliary spillway was designed to be a 175-foot long by 2-foot deep notch in the concrete core-wall. It was constructed 200 feet long. The auxiliary spillway was designed to allow water to flow over the rockfill on the downstream slope of the embankment. The outlet works is located directly to the right of the main spillway. It consists of two 2-foot square concrete conduits with concrete sluice gates at the upstream end. The various features of the dam, as designed, are shown on the Plates at the end of the report. The existing features are shown ~~on the Photographs~~ in Appendix D.

b. Location. The dam is located on Harveys Creek, approximately 8.8 miles northwest of West Nanticoke, Pennsylvania. Bryant Pond Dam is shown on USGS Quadrangle, Harveys Lake, Pennsylvania, with coordinates N41°19'00" and W76°04'15" in Luzerne County, Pennsylvania. Harveys Lake is located upstream from Bryant Pond Dam on Harveys Creek 2.8 miles northeast of Bryant Pond Dam. A location map is shown on Plate 1.

c. Size Classification. Small (16 feet high, 120 acre-feet, existing conditions).

d. Hazard Classification. High hazard. Downstream conditions indicate that a high hazard classification is warranted for Bryant Pond Dam (Paragraph 5.1c.(5)).

e. Ownership. Estate of Glendora Bryant, care of Mr. Burt Bryant, R.D. 2, Dallas, Pennsylvania.

f. Purpose of Dam. Recreation.

g. Design and Construction History. Charles S. Miles, consulting engineer of Wilkes-Barre, designed Bryant Pond Dam in 1913. Construction of Bryant Pond Dam probably commenced in 1913 or 1914. There was an old timber crib dam at the site before this date. The dam was being constructed by Andrew Raub, executor of the Samuel Raub Estate, who was the original owner. The dam was originally

intended for recreation. Construction was started without the knowledge of the Pennsylvania Water Supply Commission (PWSC), who was legally responsible for issuing a permit prior to construction. The PWSC, upon discovering that the dam was being constructed, issued an order, in June 1914, to stop construction until plans for the dam were submitted and approved. The partially constructed dam was inspected by the PWSC in early July 1914. They discovered that the dam as constructed varied significantly from the design. They ordered that the Owner submit plans showing how the dam was constructed to that date and the proposed plans to complete the structure.

Revised plans were submitted to the PWSC in late July 1914, and a permit was issued dependant upon the removal of certain poor construction conditions incorporated into the original construction. The dam was inspected by the PWSC in September, November, and December 1914. Both the PWSC inspection reports and a letter from Mr. Miles indicate that the requirements of the PWSC had been met, except that the core-wall near the right abutment was constructed 1-foot below design elevation. The PWSC ordered remedial measures for the area. Specifics concerning the construction are addressed in Section 2.

In the first post-construction inspection by the PWSC during 1919, deterioration of the structure was noted. Repairs were ordered. Repairs were again ordered after the inspection of 1920. These were apparently never accomplished. Specifics concerning the inspection reports referenced hereafter are in Appendix A.

Bryant and Williams, an ice company, acquired the dam sometime between 1920 and 1922. Repairs were again ordered after the next PWSC inspection in 1922. In the PWSC inspection of 1923, it was noted that only some minor repairs had been accomplished. Further deterioration was noted in the inspections of 1924 and 1926, when repairs were again ordered. Repairs were again ordered in 1928. An inspection by the Commonwealth in 1929 noted that some repairs had been made but that the dam was still in poor condition. Additional repairs were ordered. Although some further repairs were accomplished, the Commonwealth threatened legal action in 1931 if all the required repairs were not made. The Owner accomplished further repairs in

1932 and 1933. The dam was overtopped in 1933 for a depth of 0.5 foot; it was reported that no damage was done to the embankment. Although some additional work was done in 1934, much additional remedial work remained.

Repairs were again ordered in 1936; these included the removal of flashboards that had been placed on the main spillway crest. In a 1938 inspection by the Commonwealth, it was noted that the flashboards had been removed, that two ice chutes had been constructed along the top of the dam, but that other repairs had not been made. The Owner stated at this time that he could not entail further expense for repairs.

The Commonwealth dropped the matter until 1952, when the Pennsylvania Fish Commission (PFC) took interest in the structure. The Commonwealth, in conjunction with the PFC, inspected the dam. Although it was "in a state of complete disrepair", with numerous defects, it was the Commonwealth's opinion that it would "last another 10 years". The Commonwealth informed the PFC in 1952 that the dam would have to be rebuilt, but that rebuilding or extensive repairs would not be required in the immediate future. The Commonwealth informed the PFC that work to be undertaken immediately in order to protect the structure for the immediate future included:

"1. Remove all brush, trees, etc. from the embankment and for at least ten feet below the dam.

2. Remove enough of the present concrete core wall to secure a level crest throughout its length. This will cause overtopping to occur as a relatively thin sheet over the entire crest length and prohibit concentrations of flow at a few spots.

3. Additional heavy stone riprap will probably be necessary on the downstream face to provide an adequate fill to support the badly cracked core wall.

4. It may be necessary to place some thoroughly compacted clay fill on the upstream face in the area of the spillway to cut off excessive leakage at that point."

The PFC leased the dam about this time.

There was a misunderstanding about the terms of the lease. The Owner thought that the PFC would repair the dam. He wrote to the Commonwealth in 1971, complaining about its condition, which he claimed was hazardous. The Commonwealth responded to the Owner that, although it was in poor condition, it was not in imminent danger of failure. In January 1972, the PFC confirmed this opinion in a letter to the Commonwealth. In February 1972, the Commonwealth asked the PFC if they intended to maintain a dam at the site; the Commonwealth stated that the dam was in poor condition and that "it is our open question whether the existing dam should be rehabilitated or removed". The PFC responded that they were trying to settle the terms of the lease with the Owner.

The Owner reported that, two days prior to the peak flow from Tropical Storm Agnes in June 1972, a dam upstream failed, causing the overtopping of Bryant Pond Dam and the breaching of the embankment. The PFC terminated their lease shortly after this. Apparently, nothing immediately was done to repair the embankment. The Owner engaged an engineer to determine the feasibility of repairing the embankment. The engineer, Sweinberg and Kolesar Associates, of Forty Fort, surveyed the embankment in January 1975 (Plate 5).

Tropical Storm Eloise in September 1975, caused a substantial flow through the already breached dam. In October 1975, the Commonwealth met with the Owner and inspected the dam. The Owner stated that he wanted someone to repair it. The Commonwealth stated that the Owner would have to fund the repairs himself. The Owner tried to obtain funds from the Small Business Administration (SBA). Their loan was dependant upon approval by the Commonwealth of plans to repair the dam.

Plans were submitted to the Commonwealth in January 1976. The plans were prepared by Sweinberg and Kolesar Associates. The plans show a completely new structure, with the portion of the existing dam to remain to be determined by the Commonwealth. As such these plans are not relevant to this report.

The Owner discussed his intentions with the Commonwealth in April 1976. Previously, the Commonwealth had indicated that the plans were unsatisfactory because

they did not involve an analysis of the existing structure. Apparently the Owner then proposed to place large boulders "against the downstream face of the dam". The Commonwealth indicated that they would approve this, although they still would consider the dam to be in an unsatisfactory condition.

The Owner acquired some funds from the SBA. He used these to repair the dam to its present condition. Since 1975, a dwelling has been constructed about one-half mile downstream from the dam in the floodplain.

h. Normal Operational Procedure. The pool is maintained at spillway crest with excess inflow discharged over the spillway.

1.3 Pertinent Data.

	Design Conditions (As constructed, may vary from design)	Existing Conditions
a. Drainage Area. (square miles)	13.7 of which 7.3 is controlled by Harveys Lake. (From Records).	14.2 of which 6.6 is controlled by Harveys Lake.
b. Discharge at Damsite. (cfs.)		
Maximum known flood at damsite	Unknown	Unknown
Outlet works at maximum pool elevation	Not Available	0
Main spillway capacity at maximum pool elevation	1,210	285
Auxiliary spillway capacity at maximum pool elevation	1,340	Does not exist
Total spillway capacity at maximum pool elevation	2,550	285
c. Elevation. (feet above msl.)		
Top of Dam	1110.2	1106.7
Maximum Pool	1110.2	1106.7
Normal Pool (main spillway crest)	1105.2	1104.7
Upstream invert outlet works	Not Available	Not Available
Downstream invert outlet works	1094.9	1094.9
Streambed at toe of dam (approximate)	1090.9	1090.9

	Design Conditions	Existing Conditions
d. Reservoir Length. (miles)		
Normal Pool	0.38	0.38
Maximum Pool	0.52	0.44
e. Storage. (acre-feet)		
Normal Pool	90	83
Maximum Pool	193	120
f. Reservoir Surface. (acres.)		
Normal Pool	18	18
Maximum Pool	22	19
g. Dam		
Type	Rockfill and earthfill with concrete core-wall.	Rockfill and earth-fill with concrete core-wall.
Length (feet)	425	425
Height (feet)	19	16
Topwidth (feet)	9	Varies 6 to 17

	Design Conditions	Existing Conditions
g. Dam. (Cont'd.)		
Side Slopes		
Upstream	1V on 2H	Uncertain, vertical at areas near top.
Downstream	1V on 1.5H	Varies, vertical to 1V on 3.4H
Zoning	Core-wall	Core-wall (cracked)
Cutoff	Core-wall founded in trench.	Core-wall founded in trench.
Grout Curtain	None	None
h. Diversion and Regulating Tunnel.	None	None
i. Spillway.		
Main Spillway		
Type	Broad-crested weir	Broad-crested weir
Length of Weir (feet)	40	40
Crest Elevation	1105.2	1104.7

	Design Conditions	Existing Conditions
i. Spillway. (Cont'd.)		
Upstream Channel	Reservoir	Reservoir
Downstream Channel	Cascade to natural stream	Cascade to natural stream
Auxiliary Spillway		
Type	Broad-crested weir	Does not exist
Length of Weir (feet)	175	N/A
Crest Elevation	1108.2	N/A
Upstream Channel	Reservoir	N/A
Downstream Channel	Over rockfill on downstream slope of dam.	N/A
j. Regulating Outlets.		
Type	Two 2-foot square concrete conduits.	Two 2-foot square concrete conduits.
Length (feet)	71	71
Closure	Concrete sluice gates at upstream end.	Permanently plugged.
Access	Bridge from top of embankment to operator.	None

SECTION 2

ENGINEERING DATA

2.1 Design.

a. Data Available. Very little engineering data were available for review for the structure as originally designed or as modified during construction. In a study performed in 1914 by the Pennsylvania Water Supply Commission, an account of design concepts, geology, construction materials and methods, and design features was prepared for the components of the dam from interviews with the Owner, visual inspection, and other sources. The 1914 study also included analyses for hydrology and hydraulics. A summary of the results of the analyses is on file.

b. Design Features. The project is described in Paragraph 1.2a. The various design features of the dam are shown on the Plates at the end of the Report. The existing features are shown on the Photographs in Appendix D. A plan and profile of the dam, as designed, are shown on Plate 2. During construction, the auxiliary spillway shown on this plate was lengthened to 200 feet. Also, 2 chutes have since been added across the top of the dam (Photograph D). A typical section of the dam as designed is shown on Plate 3. A profile of the spillway is shown on Plate 4.

c. Design Considerations. The core-wall is unreinforced and relatively thin. It is shown as being 2 feet thick on Plate 3. The 1914 Pennsylvania Water Supply Commission Report states that the trench in which the core-wall is founded is 4 to 6 feet deep. The trench caved in during construction and the trench was re-excavated and filled with concrete to a thickness of 3 to 4 feet. The core-wall was carried up for a height of 8 feet with a design thickness of 2 feet, at which point the wall was battered to a thickness of 1 foot at its top. It is not certain the wall was designed to carry the anticipated loads.

2.2 Construction.

a. Data Available. Construction data for the original structure that are available for review consist of the information contained in the 1914 report prepared by the Pennsylvania Water Supply Commission. The Pennsylvania Water Supply Commission's first report, of the dam as partially constructed, stated:

"No care has been taken to make an impervious embankment. The surface of the ground has not been stripped, and the logs of the old timber crib have not been entirely removed; the old creek channel has been filled with rock from the upstream toe to the core wall; the earth has been brought to the dam in scrapers and dumped in a loose fill, no attempt being made to deposit it in layers, or to pick out the stone, and the only means of compacting it was the travel over it."

As noted in Paragraph 1.2g, the Pennsylvania Water Supply Commission ordered changes to be made. In particular, it ordered future earthfill to be placed in layers and compacted, the logs of the old timber dam removed, and the stones in the creek bed removed.

The records state that these orders were complied with. It should be noted that the partially-constructed uncompacted embankment on an unstripped foundation was allowed to remain. Furthermore, the records state that no attempt was made to compact the rockfill on the downstream side of the core-wall.

b. Construction Considerations. It appears that initially the dam was poorly constructed. This may explain its poor performance history.

2.3 Operation. There are no formal records of operation. The records in the PennDER files indicate the embankment has performed poorly.

2.4 Evaluation.

a. Availability. Engineering data were provided by the Bureau of Dam Safety, Obstructions, and Storm Water Management, Department of Environmental Resources, Commonwealth of Pennsylvania. The Owner made himself available for information during the day of the inspection.

b. Adequacy. The type and amount of design data and other engineering data are limited, and the assessment must be based on the combination of available data, visual inspection, performance history, hydrologic assumptions, and hydraulic assumptions.

c. Validity. There is no reason to question the validity of the available data. Some of the data is in conflict, but the conflicts are relatively minor.

SECTION 3

VISUAL INSPECTION

3.1 Findings.

a. General. The overall appearance of the dam is very poor. Deficiencies were observed as noted below. A sketch of the dam with the location of deficiencies is presented in Appendix B on Plate B-1. Survey information acquired for this report is summarized in Appendix B. On the day of the inspection, the pool was 0.6 foot above spillway crest. The design main spillway is termed the spillway hereafter.

b. Embankment. The embankment is in very poor condition. Thick brush is growing along 50 percent of the upstream slope and at the right abutment of the downstream slope. The upstream slope in the 60-foot long reach that was breached during Tropical Storm Agnes is vertical with evidence of a minor amount of erosion. The top width in this breached area is 6 feet. The Owner reported that this area was repaired after Tropical Storm Eloise, but that he had insufficient funds to complete the repairs. Therefore, the downstream slope of the repaired breach section has been left vertical for 4 to 5 feet. At the bottom of the vertical drop, rockfill extends to the toe of the slope. At the top of the dam in the breach area, a 1-foot by 2-foot by 6-inch deep depression was observed.

The top of the core-wall is visible along the top of the dam, except in the breach area. It tilts about 45° downstream along the entire top of the dam except in the breach area, where it has been washed away, and in certain other areas, where it has broken off and is lying on the downstream slope. The top of the earthfill on the upstream side of the core-wall is uneven. It is a maximum of 1.6 feet below its design elevation except adjacent to the spillway, where it is 2.7 feet below its design elevation. The top of the core-wall, except at the breach area, is a maximum of 2.3 feet below its design elevation. The exisiting profiles are shown in Appendix B.

The rockfill on the downstream side of the core-wall is very uneven. Beneath one of the ice chutes it is washed out. The rockfill is covered with large, broken pieces of concrete. Some of these are part of the core-wall. The Owner reported that others are the remains of an old ice house that he used in lieu of rockfill to repair the embankment. Seepage was observed downstream from the embankment. Directly at the toe of the embankment a seep estimated at 1 gpm was flowing from a 200 square foot wet area. About 50 feet downstream the seepage increased to about 10 gpm at a localized area. This seepage then flowed to the creek. At the creek, the total seepage was estimated at 20 gpm. As a result of the previous overtoppings, the entire area downstream from the dam is covered with sediment and debris. Additional seepage was observed near the outlet works, as described hereafter.

c. Appurtenant Structures. The spillway is in fair condition. As water was flowing over it, a detailed visual inspection was not possible. It was noted that the downstream edges of the cascades were jagged and eroded. Cracks were observed in the cascade slabs. The spillway walls along the cascade are low. The top of wall is 0.6 foot above the cascade at one point. The area to the left of the left spillway wall is rockfill covered with poorly placed concrete. At the downstream toe of this area, seepage estimated at 10 gpm, including a localized seep of 5 gpm, was observed. The core-wall to the left of the spillway is intact. Cracks, which extend entirely through the structure, were observed at 4 locations. The wall is tilted forward near its center; it is also bowed.

There was no evidence of an auxiliary spillway. It apparently was washed out or it was indiscernable from the remainder of the core-wall.

The outlet works is in very poor condition. The remains of the gate operator were observed immediately upstream of the spillway. At the downstream end, a flow of about 1 cfs was discharging from the right conduit. No flow was visible from the left conduit. Although the conduits were reportedly constructed of concrete, they appear to be dry masonry covered with concrete. It is possible to see daylight through the left side of the left conduit. Seepage estimated at 20 gpm was observed

immediately downstream from the conduits. The Owner reported that an attempt had been previously made to plug the conduits with concrete and soil. He stated that the attempt was not entirely successful.

d. Reservoir Area. Harveys Lake, which controls about 50 percent of the drainage area, was visited on the day of the inspection. Harveys Lake watershed mostly consists of wooded rolling hills and the lake itself. Conditions at the outlet to the lake are sketched in Appendix C. The uncontrolled drainage area, which is below the Harveys Lake drainage area, is mostly wooded with rolling hills. Some of it is swampy. The remains of the dam upstream of Bryant Pond, which failed at the start of Tropical Storm Agnes, were observed. Development in the uncontrolled drainage area is minor. About 3 families live along the shore of Bryant Pond.

e. Downstream Conditions. Immediately downstream from Bryant Pond Dam is a small bridge that provides access for the families who live to the left of the damsite. About 0.5 mile downstream is one dwelling built on the fringes of the floodplain. The dwelling appeared to be of recent construction. Four persons were observed at the dwelling on the day of the inspection. About 300 feet downstream from the dwelling is a 12-foot high roadway embankment with four 6-foot diameter corrugated metal culverts. About 4 miles downstream from the roadway is Harveys Creek Canal Diversion Structure, which is owned by Pennsylvania Gas and Water Company and which is used for water supply. At the upstream end of the reach between the roadway embankment and the diversion structure, there are a few dwellings about 15 to 20 feet above streambed. The remainder of the reach is wooded and uninhabited. Access to Bryant Pond Dam is from a public road near the right side of the dam via a short unpaved private road.

SECTION 4

OPERATIONAL PROCEDURES

4.1 Procedure. The reservoir is maintained at spillway crest, Elevation 1104.7, with excess inflow discharging over the spillway and into Harveys Creek. The emergency drawdown outlet works is inoperable.

4.2 Maintenance of Dam. The dam is visited very frequently by the Owner. Informal inspections of the dam are made by the Owner. Formal inspections are not made. Brush is cut at irregular intervals. As described in Paragraph 1.2g, the many repairs ordered for this dam have essentially not been made. The repairs that have been made do not follow good engineering practice.

4.3 Maintenance of Operating Facilities. The operating facilities are not operable.

4.4 Warning Systems in Effect. The Owner stated that there is no emergency operation and warning system.

4.5 Evaluation of Operational Adequacy. The maintenance of the embankment and spillway is very poor. The outlet works is not operational nor could it be made operational. Inpsections are necessary to detect hazardous conditions at the dam. An emergency operation and warning system is necessary to mitigate the hazards downstream, should stress become evident at the dam. Judging by the records in the PennDER files, the Owner does not have the resources to maintain and repair the structure.

SECTION 5

HYDROLOGY AND HYDRAULICS

5.1 Evaluation of Features.

a. Design Data. The Pennsylvania Water Supply Commission prepared a report upon the application of the Owner, prior to issuing a permit for the continued construction of the dam. In that report, they estimated the design spillway capacity to be greater than 1,790 cfs. This was the combined capacity of both spillways. As noted in Section 3, the auxiliary spillway no longer exists.

For the existing spillway located near the left abutment, a discharge capacity of 285 cfs was used for this study. The existing spillway capacity was estimated including the effects of the low top of the dam (Appendix C).

b. Experience Data. The dam was overtopped in 1933 by 6 inches. No damage was reported from this overtopping. It was overtopped and breached during Tropical Storm Agnes in June 1972, apparently because of an upstream dam failure. The breach was not repaired when the dam was again overtopped by Tropical Storm Eloise in September 1975. It is not possible to estimate the flow for these overtoppings because the then existing top of dam profile is uncertain.

c. Visual Observations.

(1) General. The visual inspection of Bryant Pond Dam which is described in Section 3, resulted in a number of observations relevant to hydrology and hydraulics. These observations are evaluated herein for the various features.

(2) Embankment. The low areas along the top of the embankment reduce the spillway capacity. Other observations concerning the embankment are in Section 6.

(3) Appurtenant Structures. These features are evaluated in Section 6.

(4) Reservoir Area. No conditions were observed in the reservoir area that might present significant hazard to the dam. On the day of the inspection, a visit was made to Harveys Lake Dam. There is a roadway and culvert immediately downstream from the dam (Photograph J). It appeared that the roadway and culvert would be the control for all but low flows. This is confirmed by the analysis in Appendix C.

The breached dam observed upstream from Bryant Pond Dam confirms the Owner's statement of a upstream dam failure. However, judging by the size of the upstream dam, substantial additional inflow to Bryant Pond must have been occuring for the upstream dam to overtop Bryant Pond Dam.

The assessment of the dam is based on existing conditions. The effects of future development are not considered.

(5) Downstream Conditions. No conditions that would present a hazard to the dam were observed downstream. Although the recently constructed dwelling is at the fringes of the floodplain, the roadway immediately downstream of it makes its probability of being flooded high, were a failure of Bryant Pond Dam to occur. The other dwellings near the creek are sufficiently high that, although property damage might occur, the probability of loss of life is low. Harveys Creek Diversion Structure might sustain minimal damage from a failure of Bryant Pond Dam. Because of the number of persons observed at the recently constructed dwelling on the day of the inspection, a high hazard classification is warranted for Bryant Pond Dam. Access to Bryant Pond Dam is good.

d. Overtopping Potential.

(1) Spillway Design Flood. According to the criteria established by the Office of the Chief of Engineers (OCE), the Spillway Design Flood (SDF) for the size (Small) and hazard potential (High) of Bryant Pond Dam varies between the Probable Maximum Flood (PMF) and the 1/2 PMF. Because of the small downstream population, the 1/2 PMF is selected as the SDF.

(2) Description of Model. The watershed was modelled with the HEC-1DB computer program. The HEC-1DB computer program computes a PMF runoff hydrograph and routes the flows through both reservoirs and stream sections. In addition, it has the capability to simulate an overtopping dam failure.

The PMF inflow component to Harveys Lake Dam was computed and routed through the dam. The outflow was routed downstream and combined with the uncontrolled PMF inflow component to Bryant Pond Dam. The combined flow was routed through Bryant Pond Dam. Identical methods were used for various percentages of the PMF.

(3) Summary of Results. Pertinent results are tabularized at the end of Appendix C. The analysis reveals that the existing Bryant Pond Dam can pass 2 percent of the PMF without overtopping. It is estimated that, with its design conditions, Bryant Pond Dam could have passed about 20 percent of the PMF. This latter case was not modelled on the computer.

(4) Spillway Adequacy. The criteria for rating a spillway is presented in Appendix C. Since the dam cannot pass the 1/2 PMF, a further analysis was performed. It was assumed that Harveys Lake Dam would not fail. It was also assumed that no inflow occured downstream of Bryant Pond Dam. In addition, it was assumed that Bryant Pond Dam would develop a breach 60 feet wide 0.1 hour after being overtopped by 0.3 foot. A breach of this size results in an outflow of about 8,300 cfs. The resulting outflow was routed downstream. The locations of cross sections used for routing are shown on Plate C-1. For the 3 percent PMF storm, the water surface near the recently constructed dwelling would increase 8.3 feet over the water surface that would occur if the dam did not fail. For the 1/2 PMF storm, there is not a significant increase in water surface because the peak storm flow, exclusive of any dam failure, is close to the peak flow with dam failure. The spillway capacity is rated as seriously inadequate.

SECTION 6

STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations.

(1) General. The visual inspection of Bryant Pond Dam, which is described in Section 3, resulted in a number of observations relevant to structural stability. These observations are evaluated herein for the various features.

(2) Embankment. Brush and trees growing on or near the embankment are undesirable. The performance history of the embankment indicates that excessive settlement has been occurring almost constantly since the embankment was completed. The records are replete with orders to raise and repair the embankment, especially the downstream rockfill. As none of the repairs were ever fully completed, as stated in the records, it is not possible to determine the amount of settlement occurring over any given period. As noted in Section 2, the initial poor construction practices may be the cause of the poor performance.

The seepage observed downstream from the embankment is significant. As some of the seepage areas are localized, they may indicate a flow concentration through parts of the embankment. As the area downstream from the embankment is covered with sediment and debris, and because seepage could be occurring beneath the sediment, a full assessment of the seepage is not possible.

As noted in Section 2, it is uncertain that the thin, unreinforced concrete core-wall was properly designed to sustain the anticipated loads. As the rockfill downstream settled, the passive pressures, which may have been relied upon in design, never fully developed. In its present state, the concrete of the core-wall is in good condition. The top section of the core-wall appears to have been overstressed and therefore failed. The core-wall beneath, where visible, appears to be close to vertical. However, judging by its present condition and performance

history, the core-wall cannot be relied upon to resist embankment loads or to act as a cutoff. As replacement of the core-wall would require the excavation of the embankment, the embankment is considered to be beyond repair.

(3) Appurtenant Structures. The conditions at the spillway are an indication of the lack of maintenance. The low side wall is a hydraulic design deficiency. The seepage observed from the toe of the embankment at each side of the spillway may be emanating from the spillway, judging by the open areas in the spillway walls and the cracks in the spillway slabs. Judging by the poor condition of the concrete conduits at the downstream end, it is not certain the outlet works conduits are watertight. Some of the seepage observed immediately downstream from the right conduit may have been emanating from the conduit. The Owner's plugging of the conduits was not totally successful. The upstream closure is unreliable. Furthermore, there is no way of drawing down the reservoir. As repair of the outlet works would require its complete replacement, the outlet works is considered to be beyond repair.

b. Design and Construction Data. There is no record of a stability analysis for the embankment or of a structural design for the core-wall. Both the design and the construction methods used, as previously described, are deficient.

c. Operating Records. There are no formal records of operation. As noted previously, the performance history of the embankment is poor.

d. Post-construction Changes. The records in the PennDER files indicate that the repairs that have been attempted were not accomplished adequately because of insufficient funding and lack of knowledge of good dam design and maintenance. Not repairing the washout, which presently exists on the embankment, leaves the core-wall with less downstream support than in other areas. In view of its performance history, this is of concern. The repairs made to the breach that was created during Tropical Storm Agnes are of major concern. The breached area was repaired with soil of unknown quality. The method of

placement is not known. The existing topwidth in this area is 6 feet. The upstream side of the repaired breach area is vertical for the upper 2 feet. The downstream side is vertical, at one area, for the upper 5 feet. A depression on the top of this area was noted. Should the repaired area become saturated, for whatever reason, the stability of the repaired area would be less than marginal. A failure of this area would re-create the breach caused during Tropical Storm Agnes. There is no certainty that the breach would not develop beyond its past size.

e. Seismic Stability. Bryant Pond Dam is located in Seismic Zone 1. Normally it can be considered that if a dam in this zone has adequate factors of safety under static loading conditions, it can be assumed safe for any expected earthquake loading. However, there is no evidence to suggest that the embankment would be stable during an earthquake.

SECTION 7

ASSESSMENT, RECOMMENDATIONS, AND PROPOSED REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety.

(1) Based on visual inspection, available records, calculations, and past operational performance, Bryant Pond Dam is in very poor condition and is judged to be unsafe, emergency. With existing conditions, the spillway will pass only 2 percent of the PMF without overtopping the dam. A failure of the dam will increase the hazard to loss of life at one recently constructed home downstream. The spillway capacity is rated as seriously inadequate. The embankment has been overtopped twice in its operational history.

(2) Furthermore, excessive settlement has occurred on the embankment, especially on the downstream rockfill, over its entire operational history. This has contributed to the breaking of the concrete core-wall. At present, the core-wall is broken and tilted over the entire length of the dam, except where the dam was breached and subsequently repaired. As the core-wall cannot be relied upon to be effective, the embankment is considered to be beyond repair.

(3) The attempted repairs by the Owner were not designed or made in accordance with good engineering practice and are inadequate. The repairs to the breached area are unsafe.

(4) The outlet works is considered to be beyond repair. There is no means of drawing down the reservoir.

b. Adequacy of Information. The information available is such that an assessment of the condition of the dam can be inferred from the combination of visual inspection, past performance, and computations performed prior to and as part of this study.

c. Urgency. The recommendation in Paragraph 7.2 should be implemented immediately.

d. Necessity for Further Investigations. Accomplishment of the measure outlined in Paragraph 7.2 will not require further investigations by the Owner.

7.2 Recommendations and Remedial Measures.

a. The following measure is recommended to be undertaken by the Owner immediately:

(1) Draw down the reservoir and then breach the dam. The breach should be of sufficient size that it is not possible to impound any significant quantity of water behind the dam during a flood. The method of breaching should be in accordance with good engineering practice. The breaching should be performed under the supervision of a professional engineer and it should be carefully accomplished by an experienced contractor to avoid creating a hazard downstream. Any structure that might replace the existing dam should be considered a new structure by the Commonwealth. Due consideration of the poor performance history of the existing features of the dam should be given before an attempt is made to incorporate them into a new structure.

SUSQUEHANNA RIVER BASIN

HARVEYS CREEK, LUZERNE COUNTY

PENNSYLVANIA

BRYANT POND DAM

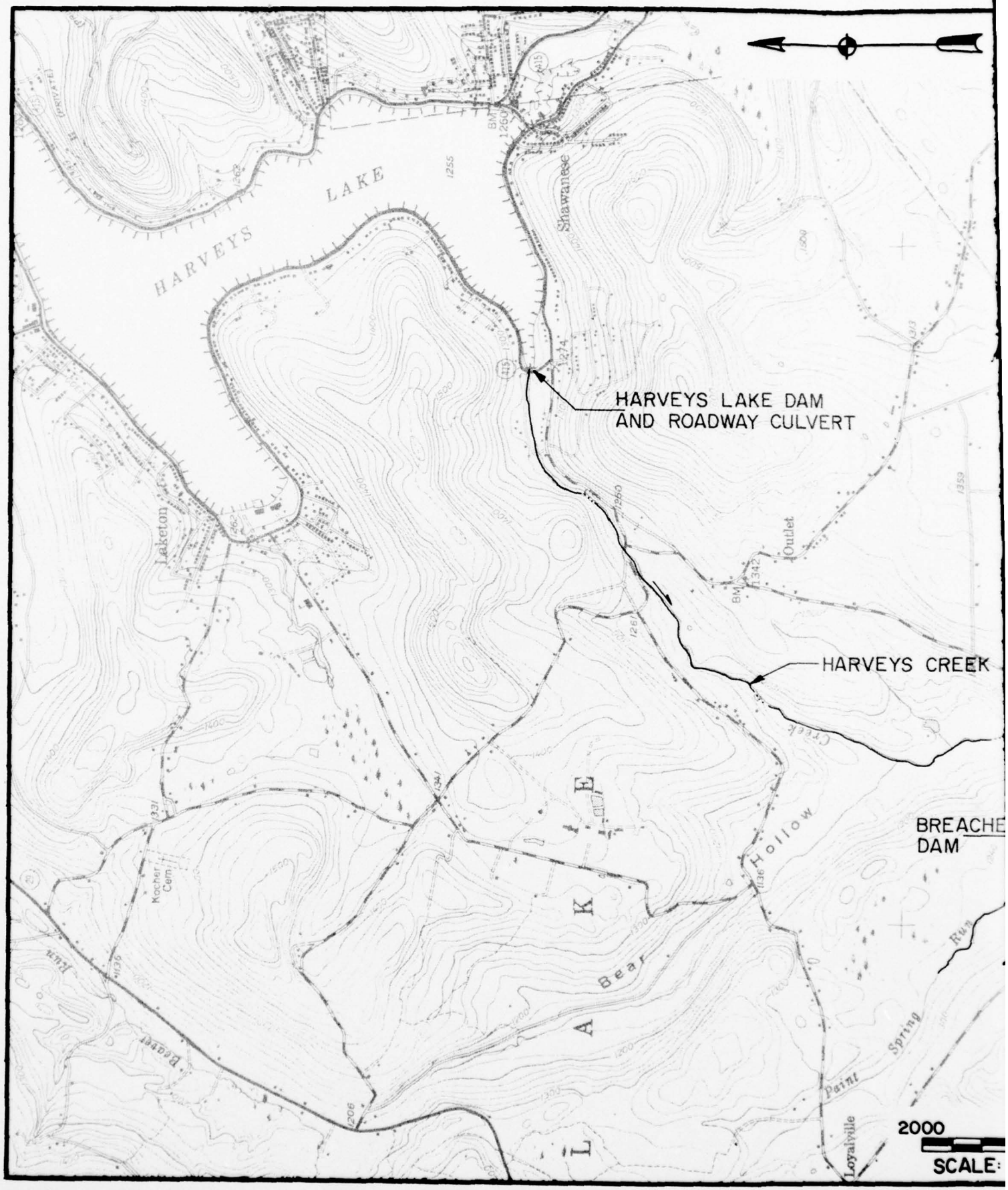
NDI ID No. PA-00544
DER ID No. 40-11

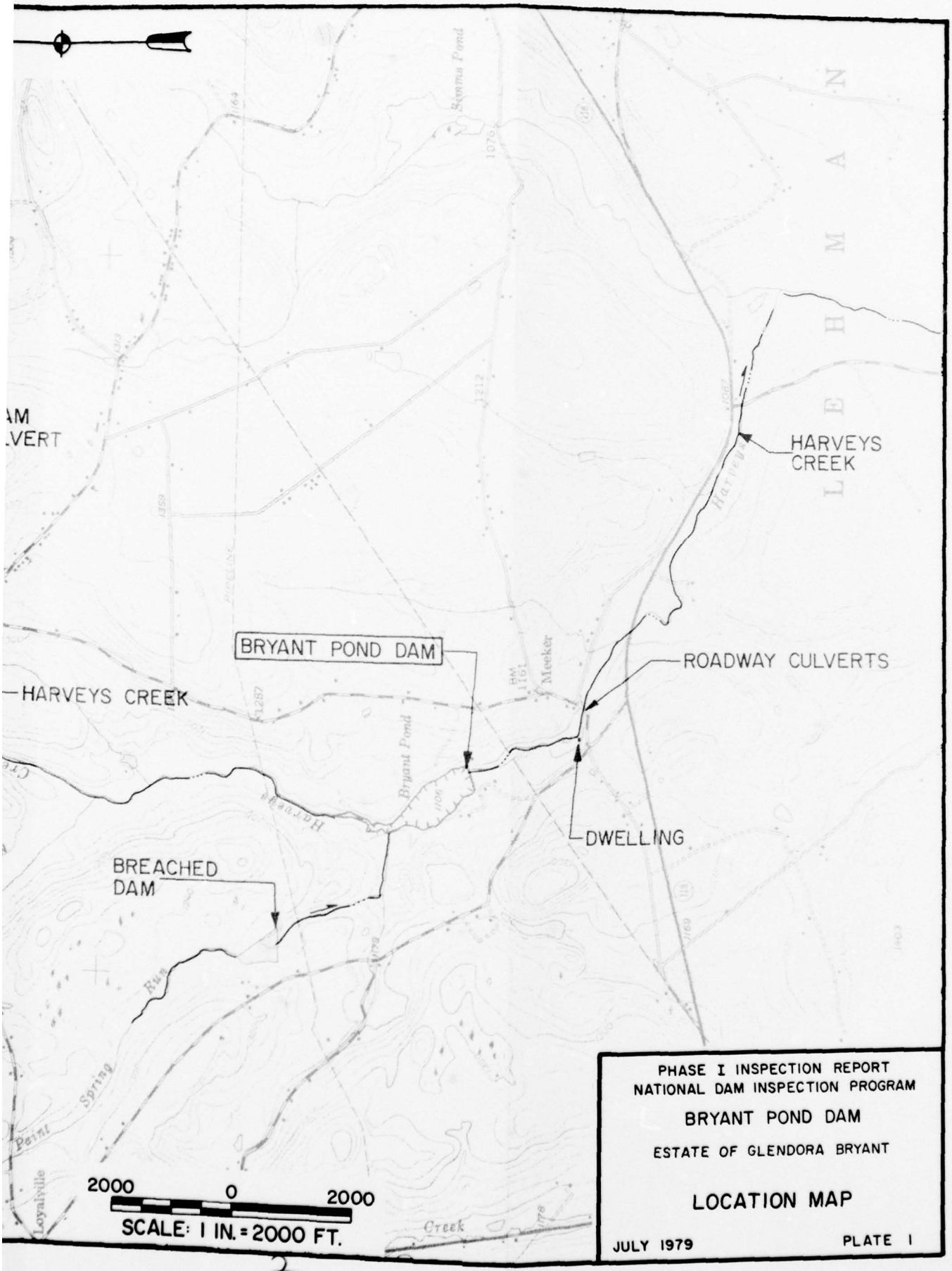
ESTATE OF GLENDORA BRYANT

PHASE I INSPECTION PROGRAM

JULY 1979

PLATES


HARVEYS LAKE DAM
AND ROADWAY CULVERT
HARVEYS CREEK
BREACHE
DAM
HARVEYS
LAKE
Shawanese
Laketon
Outlet
Bear
Hollow
Spring
Run
Beaver
Run
Kocher
Cem.
Loyalville
2000
SCALE:



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

BRYANT POND DAM

ESTATE OF GLENDORA BRYANT

LOCATION MAP

JULY 1979 PLATE 1

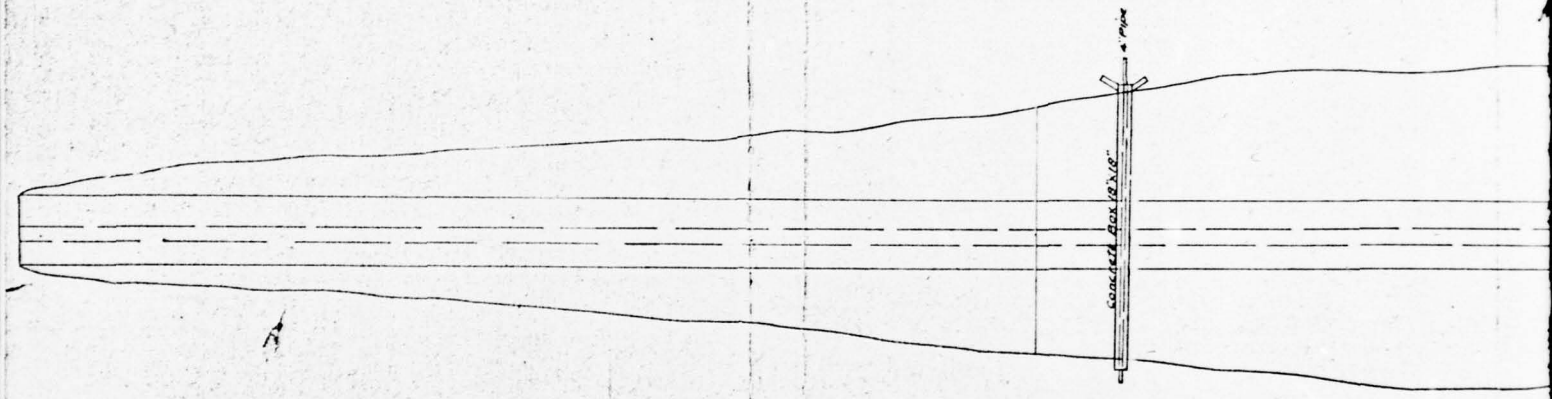
Plan and Sections of Proposed Dam on Harvey's Creek

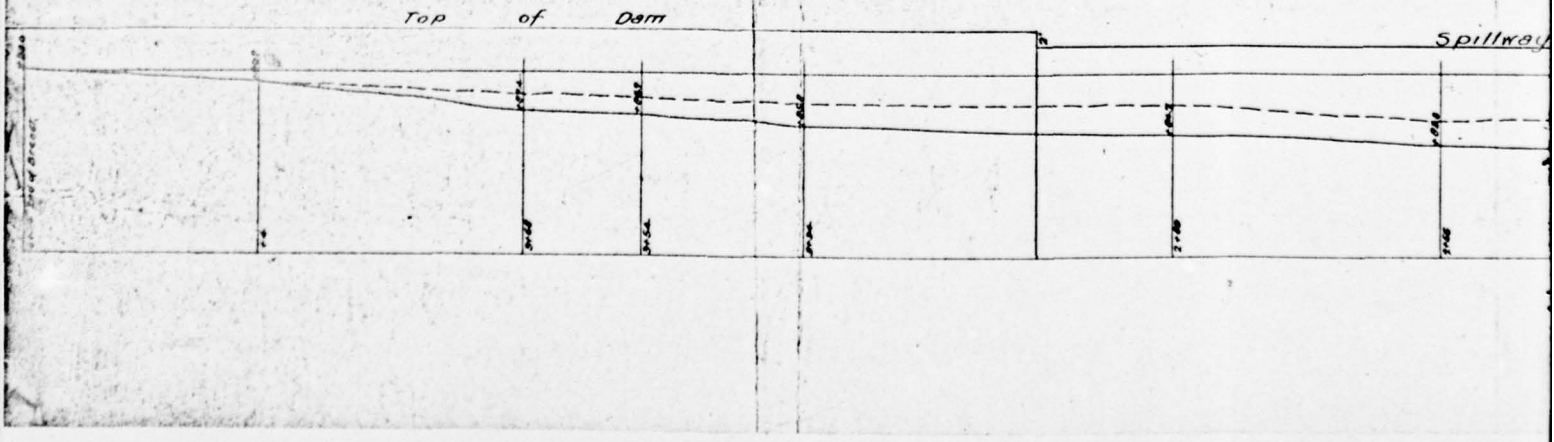
FOR

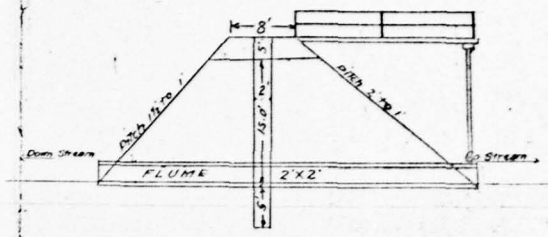
Samuel Raub Estate, Lake Township Luzerne Co Penna.

Sept 10, 1913

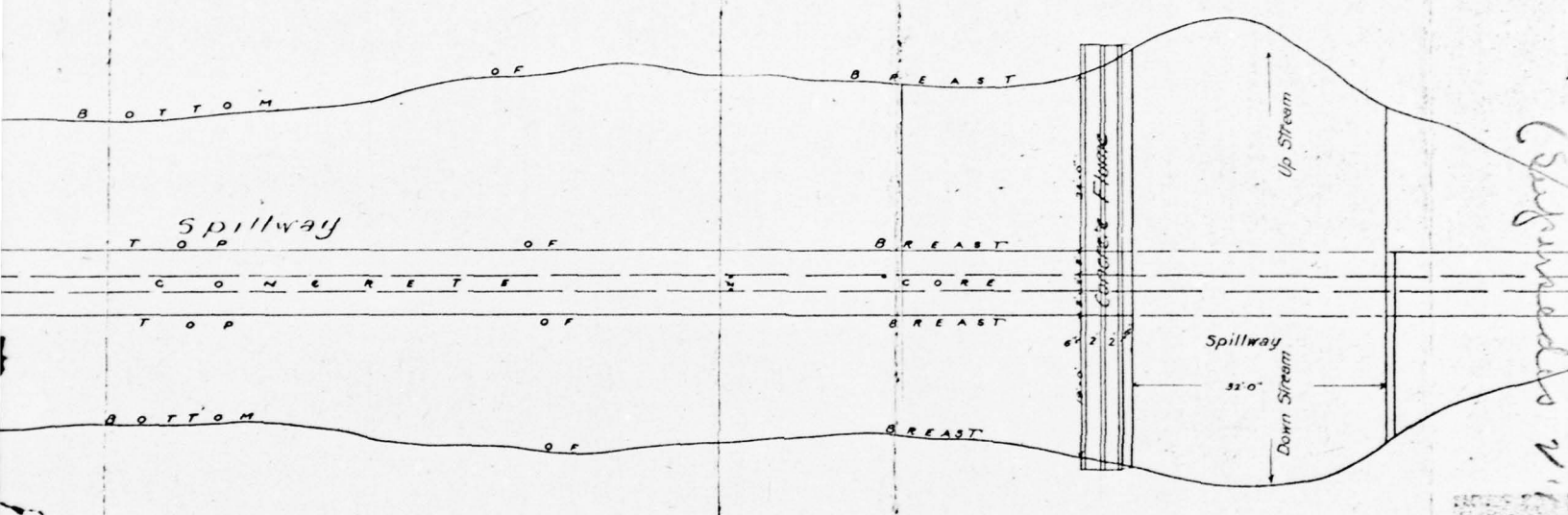
Thos S Miles
Engr



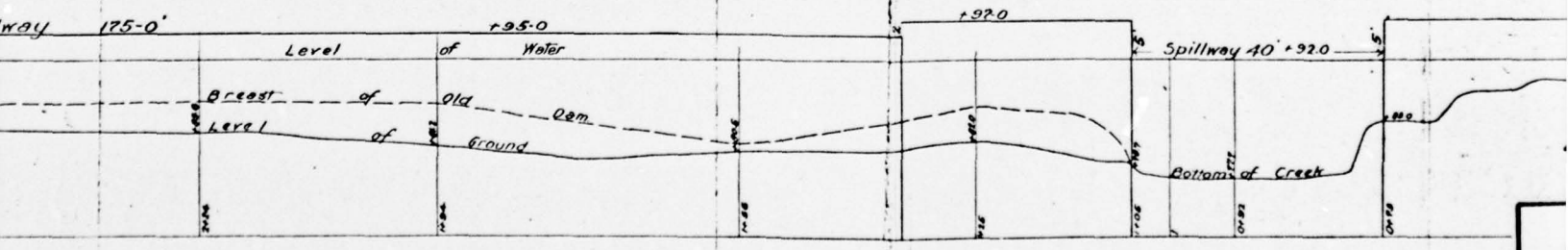




Section through Breast

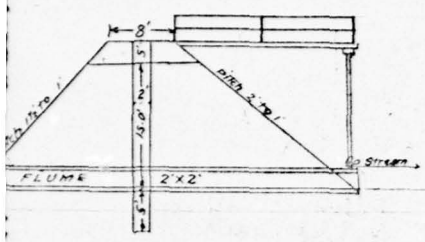


Plan of Breast

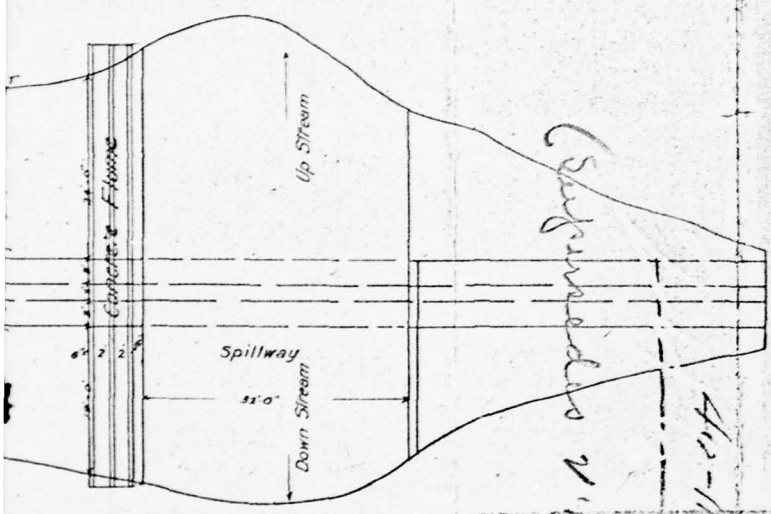


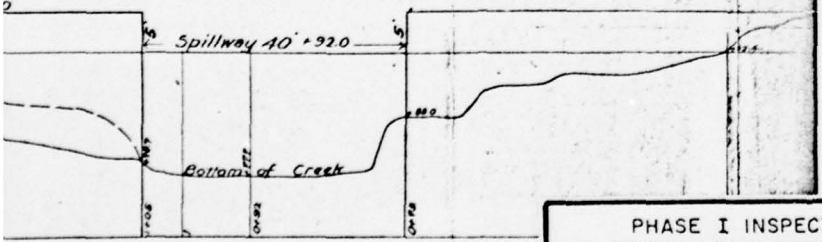
Section of Breast

2



Section through Breast





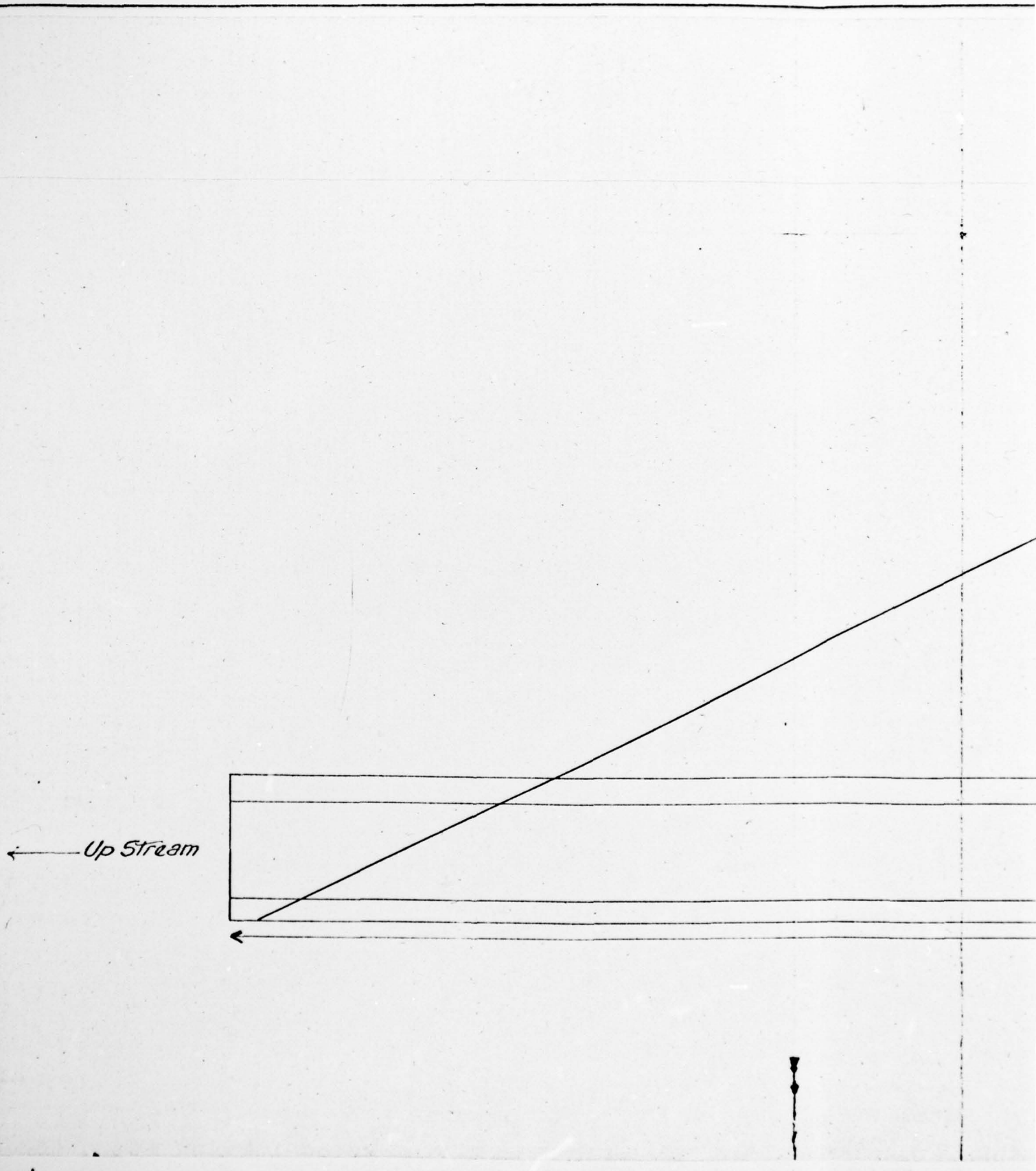
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

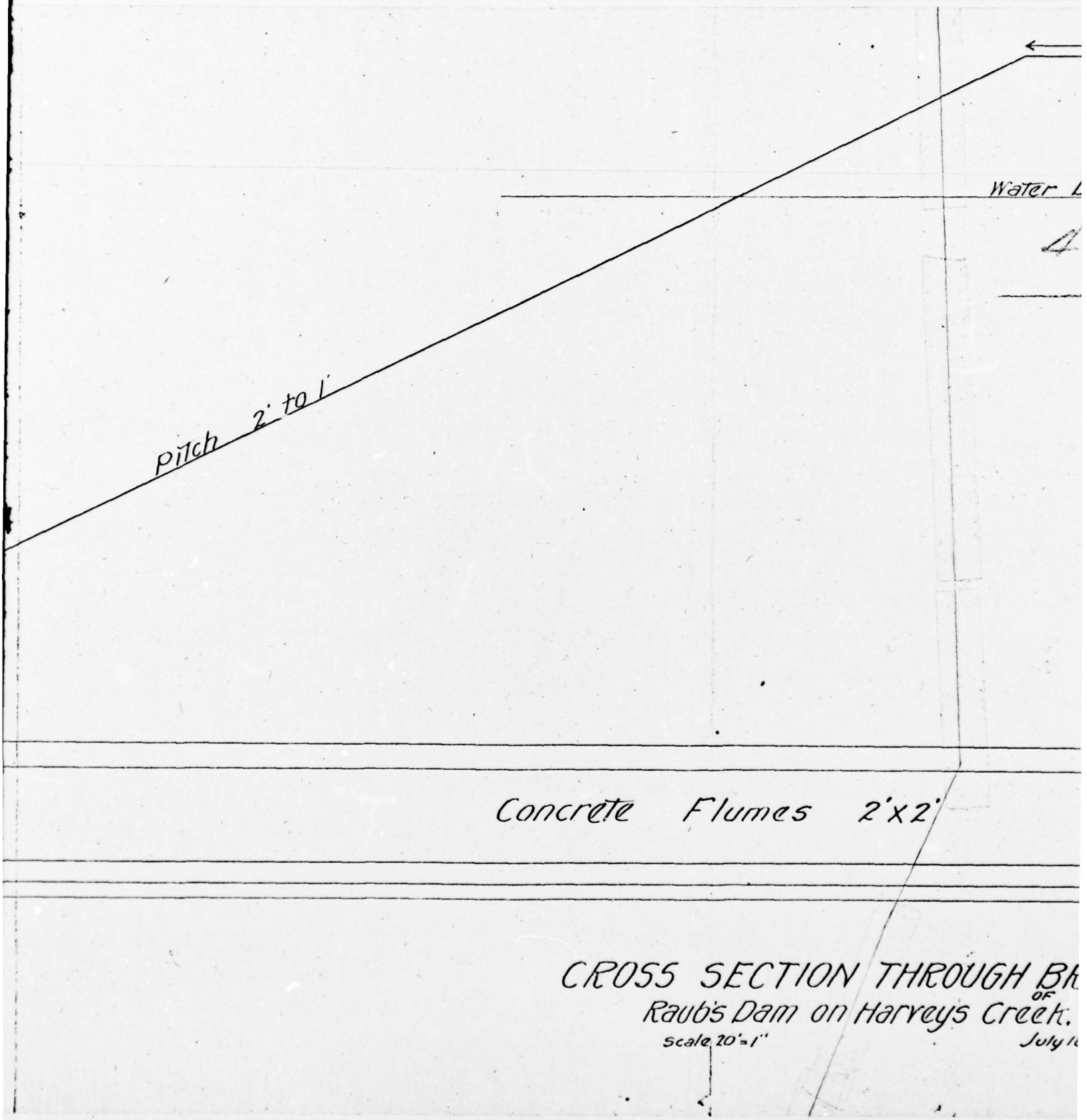
BRYANT POND DAM

ESTATE OF GLENDORA BRYANT

PLAN AND PROFILE

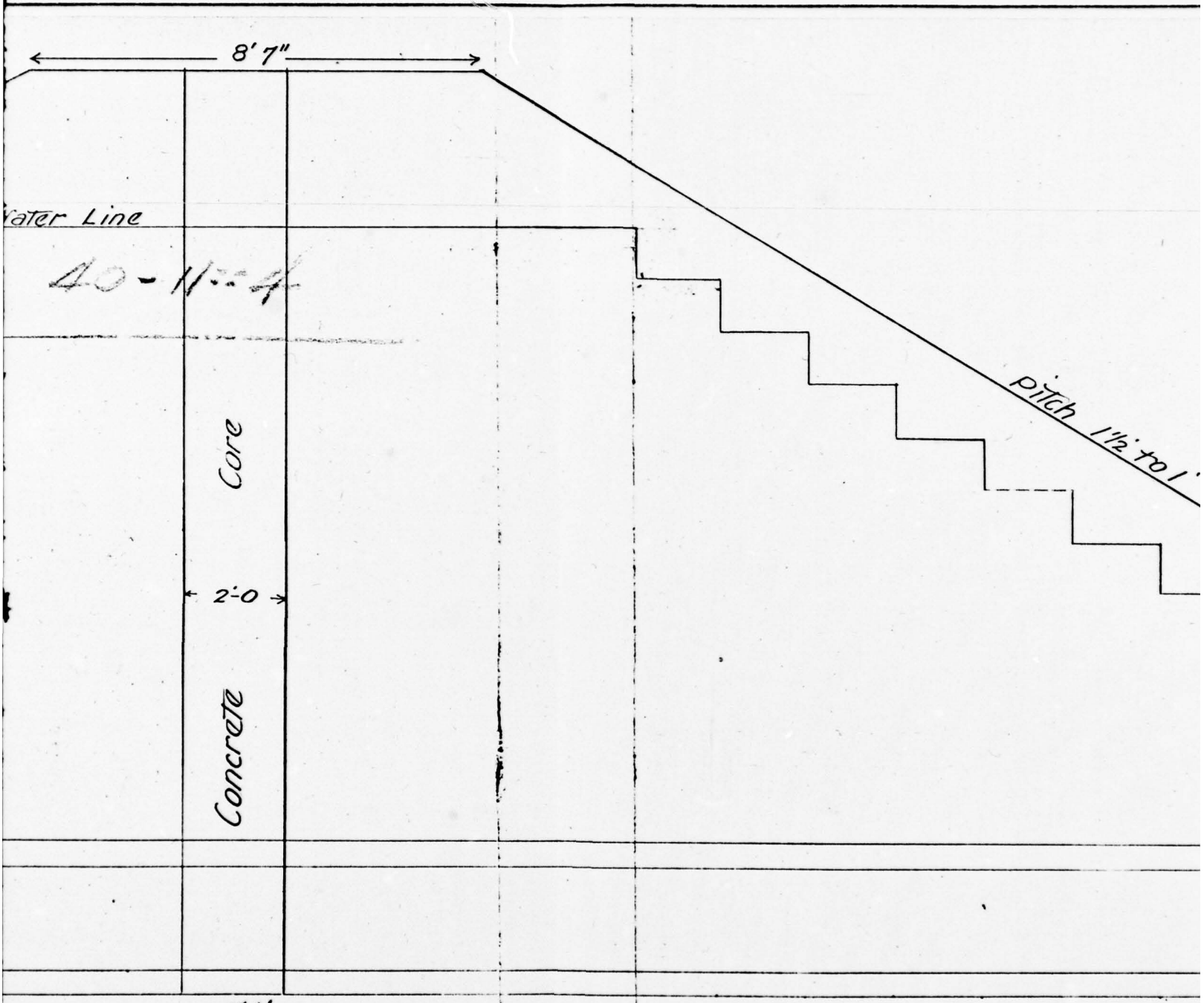
JULY 1979 3 PLATE 2


Up Stream



CROSS SECTION THROUGH BR
OF
Raub's Dam on Harveys Creek.

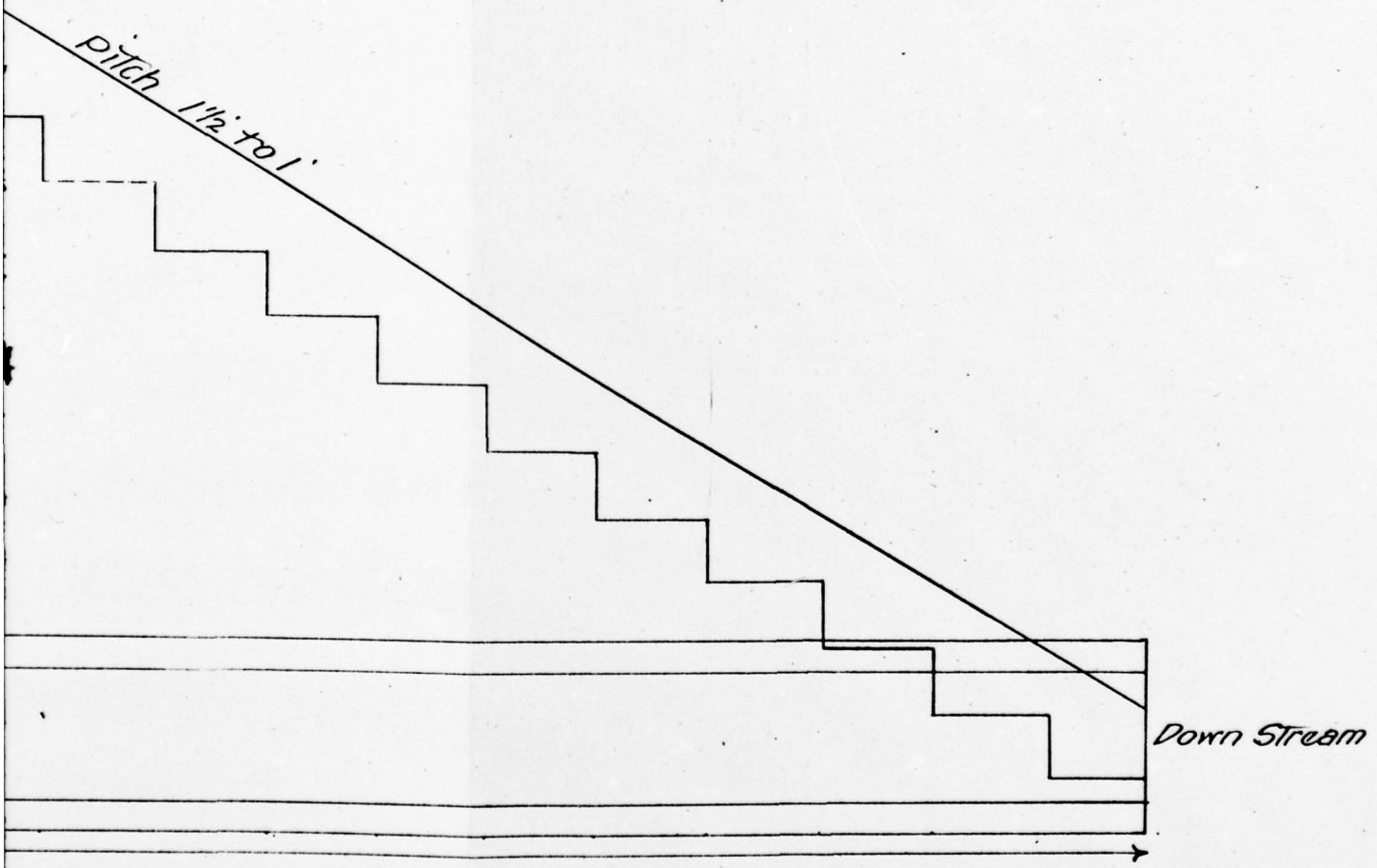
Scale 10'=1" July 1



SH BREAST OF DAM AT SPILLWAY
OF
reek. Lake Township Luzerne Co. Pa.
July 18. 1914

C. S. Mills
ENGR.

3



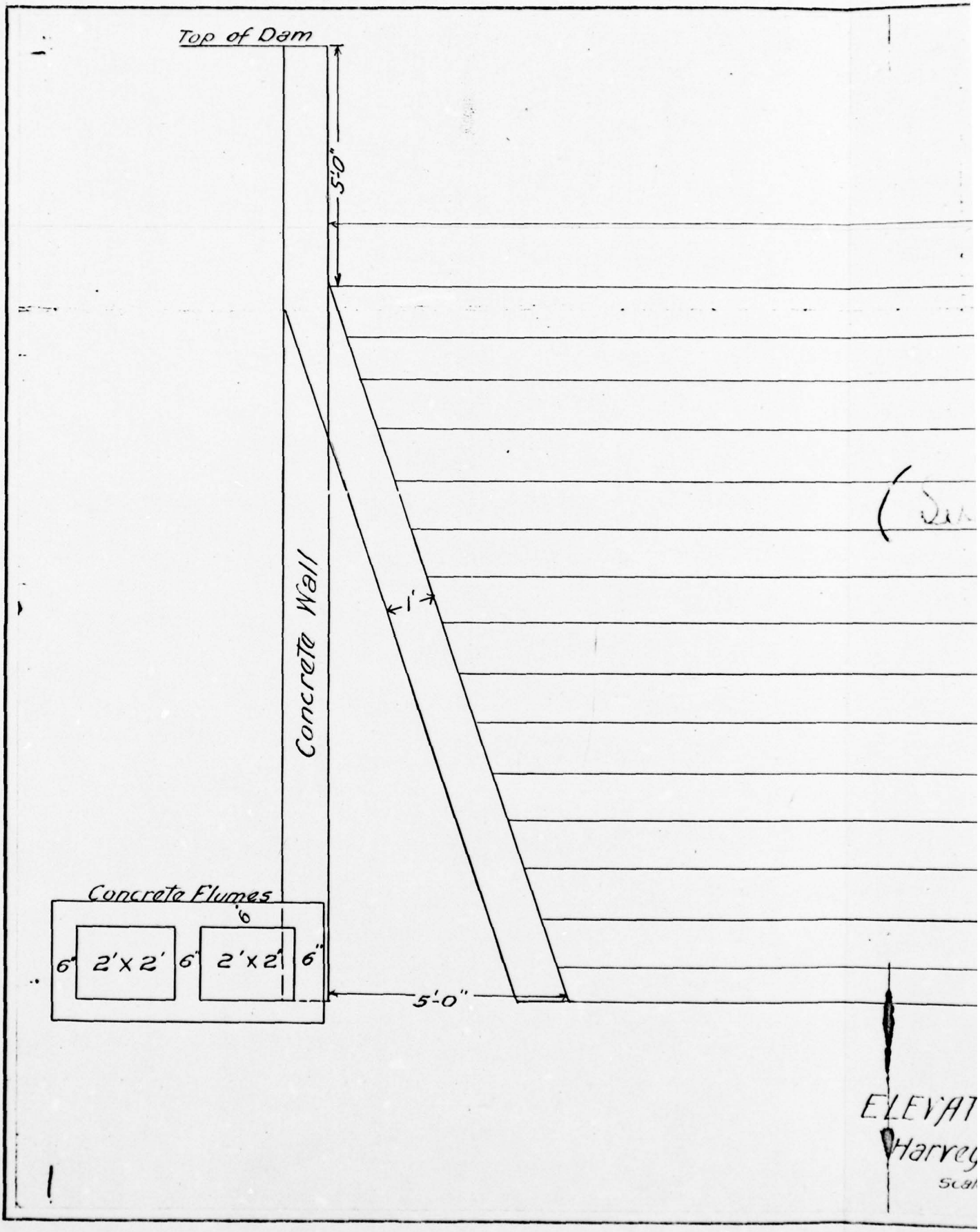
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

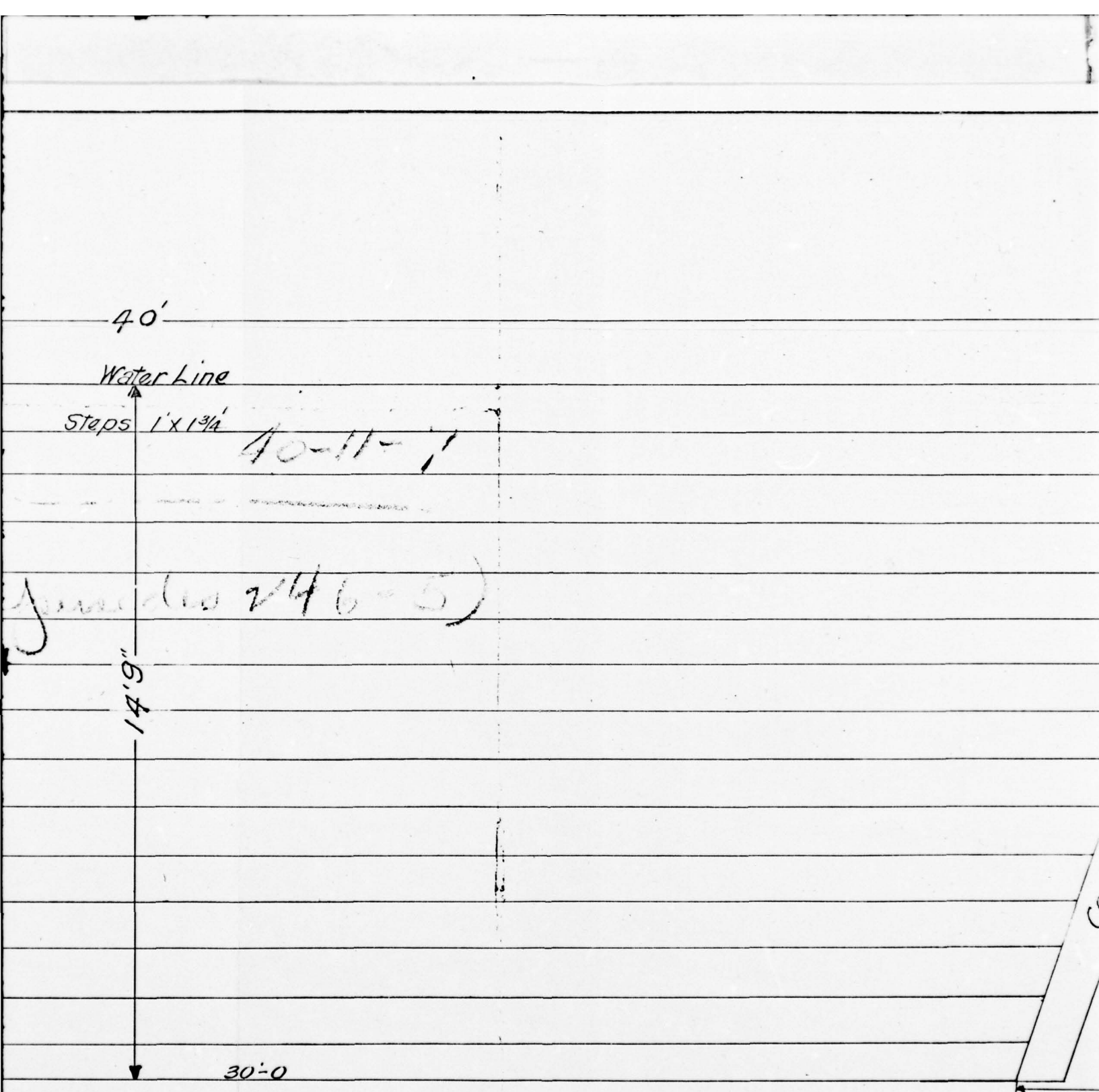
BRYANT POND DAM

ESTATE OF GLENDORA BRYANT

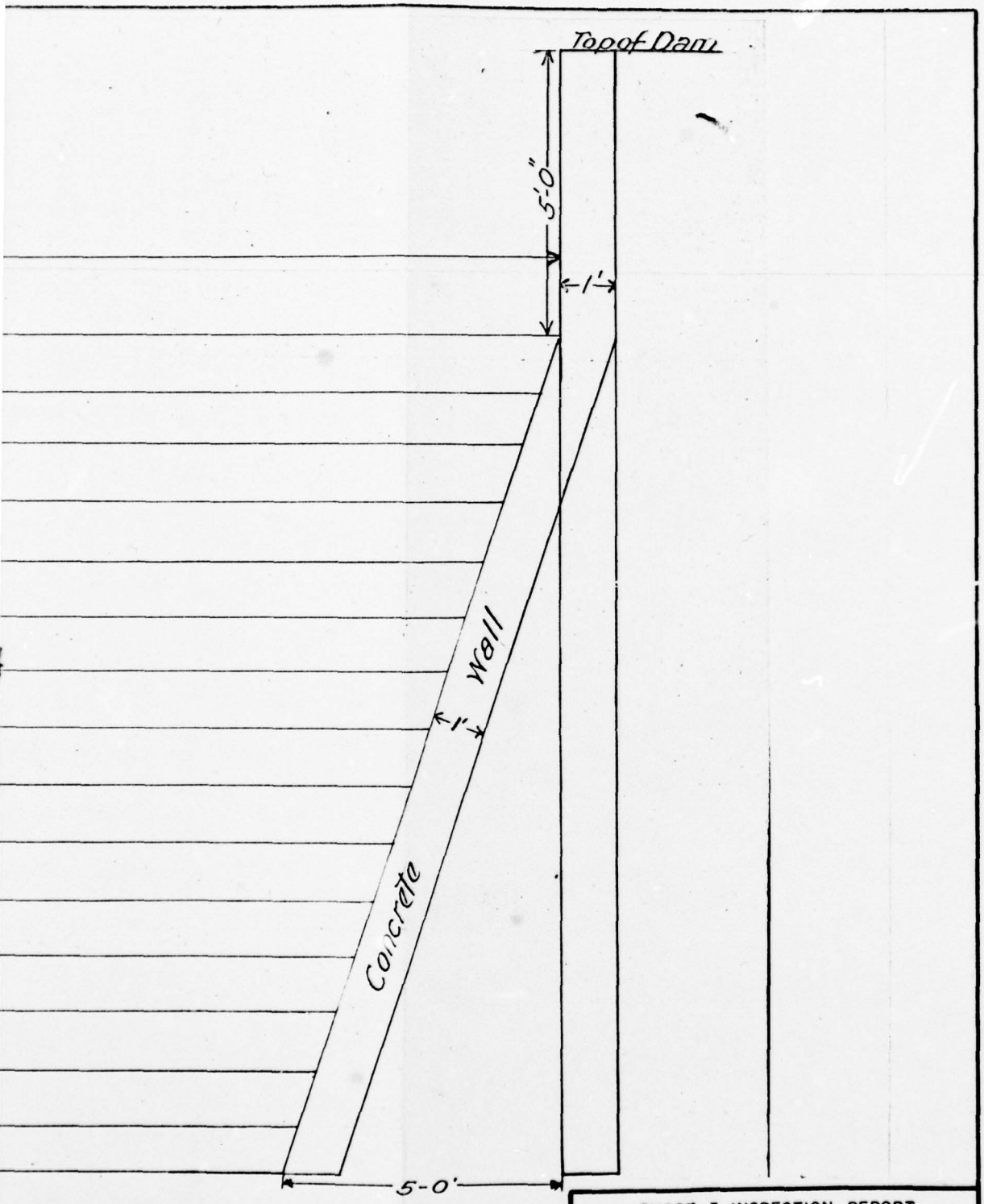
SECTION

JULY 1979 PLATE 3


Top of Dam
5'-0"
Concrete Wall
1'
Concrete Flumes
6"
6"
2'x2'
6"
2'x2'
6"
5'-0"



TION OF SPILLWAY AT RAUB'S DAM
y's Creek, Lake Township, Luzerne Co., Pa.
le 20'=1" 2 July 18, 1914. C.S. Miles Engr.



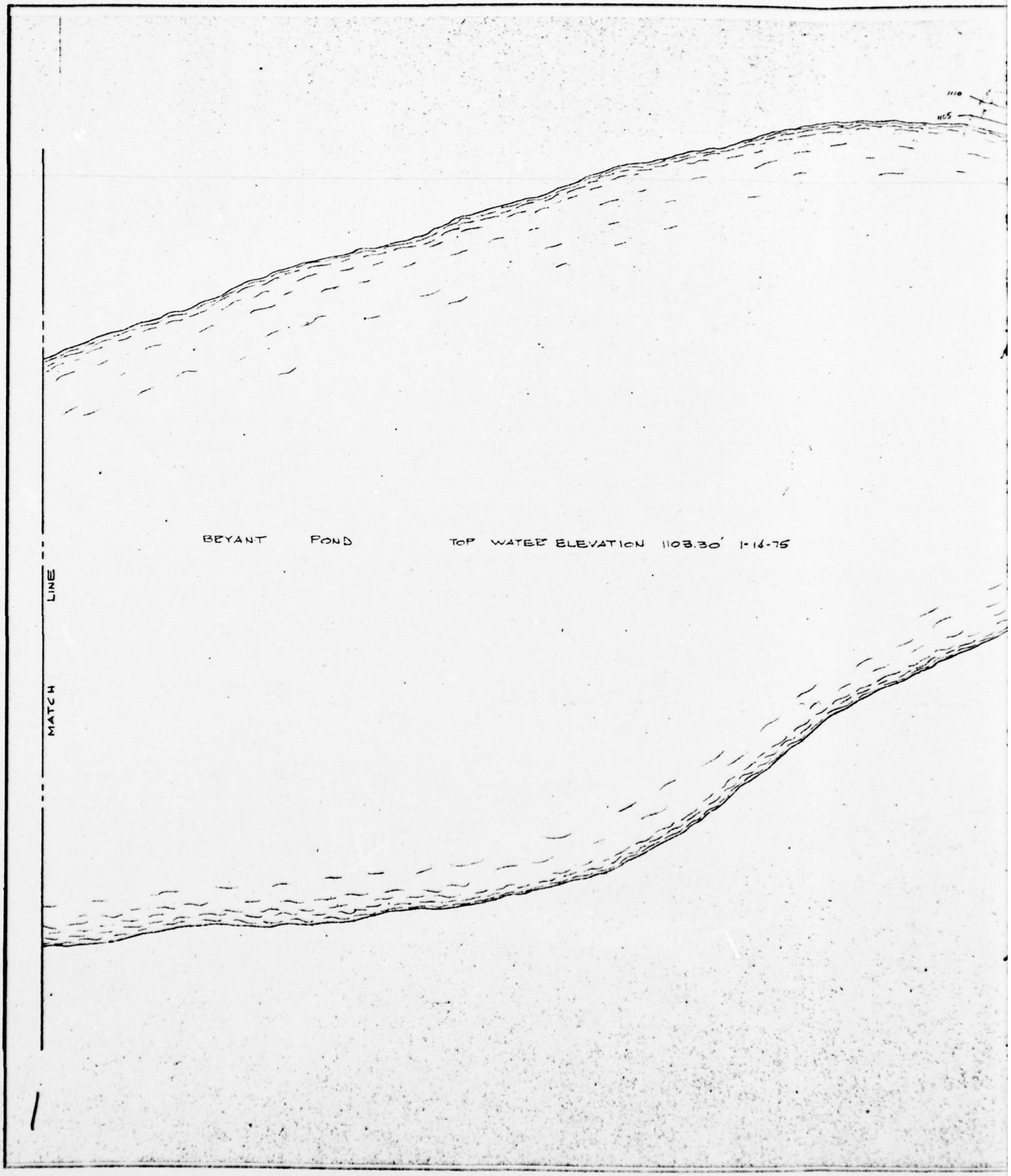
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

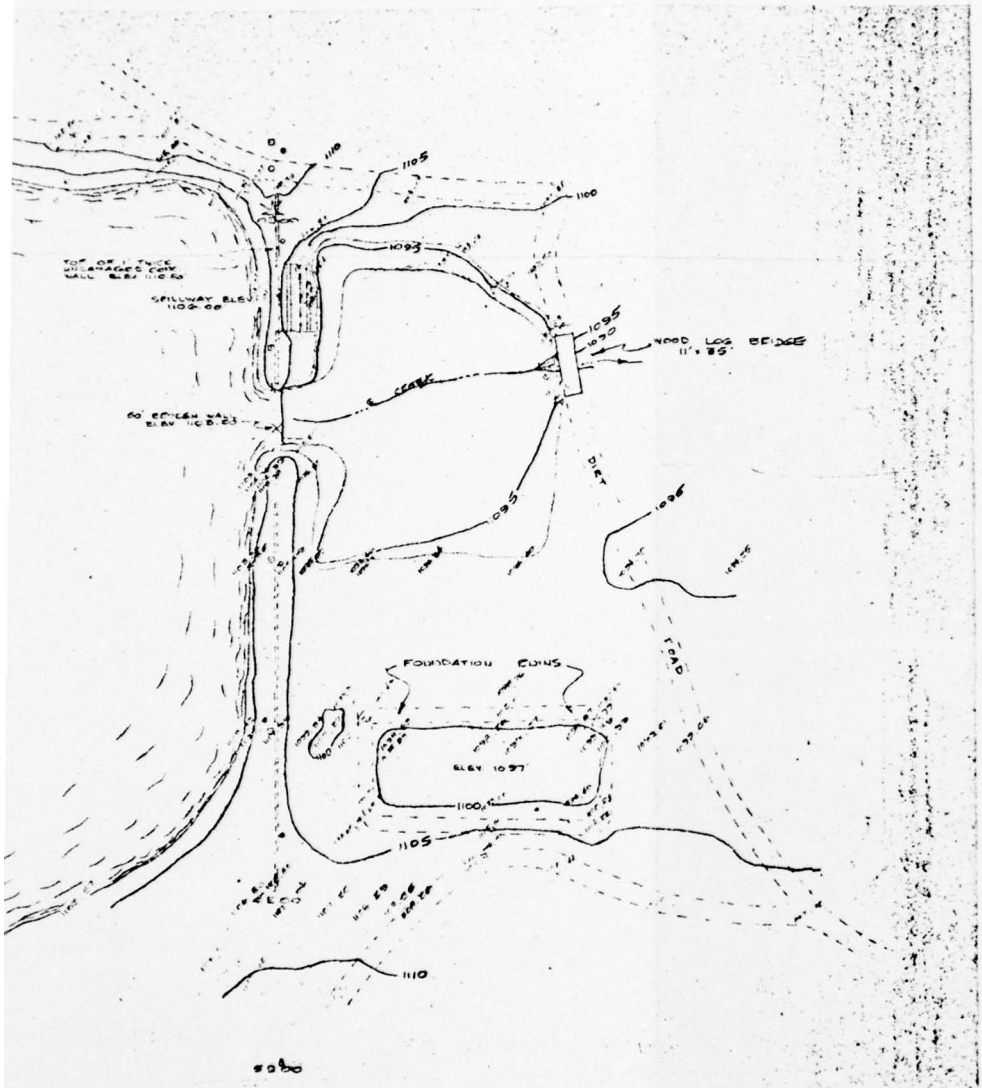
BRYANT POND DAM

ESTATE OF GLENDORA BRYANT

SPILLWAY PROFILE

JULY 1979 PLATE 4


1110
1105
BEYANT POND
TOP WATER ELEVATION 1108.30' 1-16-75
MATCH LINE



PRELIMINARY

BRYANT POND
LUZERNE COUNTY

EXISTING POND

SCALE: 1" = 50'
DATE: JAN. 7, 1976
DRAWN: E.N.
CHECKED: L.G.S.

SWENDSEN & KOLESAR ASSOCIATES
ENGINEERS & LAND SURVEYORS
180 CHASE STREET
PORTY FORT, PA.

SHEET 2 OF 6

DRAWING NO.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

BRYANT POND DAM

ESTATE OF GLENDORA BRYANT

CONDITIONS IN JANUARY 1975

JULY 1979 PLATE 5

SUSQUEHANNA RIVER BASIN

HARVEYS CREEK, LUZERNE COUNTY

PENNSYLVANIA

BRYANT POND DAM

NDI ID No. PA-00544
DER ID No. 40-11

ESTATE OF GLENDORA BRYANT

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

JULY 1979

APPENDIX A

CHECKLIST - ENGINEERING DATA

CHECKLIST

ENGINEERING DATA

DESIGN, CONSTRUCTION, AND OPERATION
PHASE I

NAME OF DAM: BRYANT POND

NDI ID NO.: PA-00544 DER ID NO.: 40-11

Sheet 1 of 4

ITEM	REMARKS
AS-BUILT DRAWINGS	SEE PLATES 2, 3, AND 4 "AS-BUILT" VARIES SIGNIFICANTLY FROM THE PLATES.
REGIONAL VICINITY MAP	SEE PLATE 1
CONSTRUCTION HISTORY	BUILT 1914
TYPICAL SECTIONS OF DAM	SEE "AS-BUILT" DRAWINGS.
OUTLETS: Plan Details Constraints Discharge Ratings	SEE PLATES 2 AND 3 NO RATINGS

A-7

ENGINEERING DATA

ITEM	REMARKS
RAINFALL/RESERVOIR RECORDS	NONE
DESIGN REPORTS	1914 PENNSYLVANIA WATER SUPPLY COMMISSION REPORT
GEOLOGY REPORTS	NONE
DESIGN COMPUTATIONS: Hydrology and Hydraulics Dam Stability Seepage Studies	NONE - SOME DATA IN 1914 PENNSYLVANIA WATER SUPPLY COMMISSION REPORT.
MATERIALS INVESTIGATIONS: Boring Records Laboratory Field	NONE
POSTCONSTRUCTION SURVEYS OF DAM	SEE PLATE 5 FOR CONDITIONS IN JANUARY 1975.

ENGINEERING DATA

ITEM	REMARKS
BORROW SOURCES	Believed to be ONSITE.
MONITORING SYSTEMS	NONE
MODIFICATIONS	ADDITION OF ICE CHUTES, CIRCA 1938.
HIGH POOL RECORDS	SEE PRIOR ACCIDENTS BELOW
POSTCONSTRUCTION ENGINEERING STUDIES AND REPORTS	NONE RELEVANT TO EXISTING STRUCTURE
PRIOR ACCIDENTS OR FAILURE OF DAM: Description Reports	1933- OVERTOPPED by 6" - NO DAMAGE 1972- OVERTOPPED AND BREACHED

ENGINEERING DATA

ITEM	REMARKS
MAINTENANCE AND OPERATION RECORDS	NONE
SPILLWAY: Plan Sections Details	SEE PLATE 4 MUCH DATA IS LACKING.
OPERATING EQUIPMENT: Plans Details	SEE PLATE 3 NO DETAILS AVAILABLE.
PREVIOUS INSPECTIONS Dates Deficiencies	SEE FOLLOWING SHEETS

4-4

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT PREVIOUS INSPECTIONS FILE NO.
SHEET NO. 1 OF SHEETS
FOR
COMPUTED BY DATE CHECKED BY DATE

ABBREVIATIONS: PWSC = PENNSYLVANIA WATER SUPPLY COMMISSION
DER = PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES, ALSO AS PREVIOUSLY KNOWN, THE WATER POWER AND RESOURCES BOARD, AND THE DEPARTMENT OF FORESTS AND WATERS.
PFC = PENNSYLVANIA FISH COMMISSION.

INSPECTION, DATE, BY WHOM, AND COMMENTS

DOES NOT INCLUDE INSPECTIONS DURING CONSTRUCTION.

JULY 1919 by PWSC FLASH BOARDS ON SPILLWAY, LOWER TOE WET AND SOGGY, CORE WALL CRACKED IN SEVERAL PLACES, SPILLWAY CONCRETE DEFINING WALLS HAVE COLLAPSED AND ABUTMENTS ARE CRACKED AT THE RIGHT ABUTMENT COREWALL, HAVING SETTLED PERCEPTIBLY. DOWNSTREAM ROCKFILL AT RIGHT SIDE OF SPILLWAY HAS SETTLED 14 INCHES±. LEAKAGE TOE DOWNSTREAM FILL AT RIGHT.

ORDERED TO REPAIR DAM - AUGUST 12, 1919
OWNER REPORTED ON SEPTEMBER 7, 1919 THAT REPAIRS WOULD COMMENCE AT ONCE

MAY 1920 by PWSC The downstream rock fill appears to have settled and the pressure of the earth and water upstream has pushed the core wall so that it is out of plumb for nearly its entire length, with cracks showing near each end. Spillway abutments poor, concrete disintegrating and broken. Flashboards in right spillway bay. Waste way channel - poor conditions - side walls gone. There

IS MORE OR LESS FLOW OF WATER ALONG THE DOWNSTREAM TOE AND BELOW THAT IT IS SWAMPY; (NOTES THAT THERE USED TO BE 2 SPRINGS) PRE-CONSTRUCTION, ONE 50' RIGHT OF SPILLWAY AND ANOTHER NEAR THE RIGHT END OF THE DAM.

REPAIRS ORDERED JULY 1920.

OWNER DISCUSSED WITH PWSC AUGUST 1920; OWNER WAS INFORMED THAT REPAIRS COULD BE DELAYED A YEAR.

JUNE 1922 by PWSC NOTES NEW OWNER BRYANT AND WILLIAMS. CREST UNEVEN. DOWNSTREAM FACE ROUGH. CORE WALL LEANS DOWNSTREAM DUE TO EITHER SETTLEMENT OF ROCKFILL ON DOWNSTREAM SIDE OR ICE PRESSURE. CONSIDERABLE LEAKAGE, SWAMPY AT LOWER TOE. WASTEWAY CHANNEL - POOR DISINTEGRATING. NOTES CONSTRUCTION OF ICE HOUSE.

REPAIRS ORDERED SEPTEMBER 1922

NO RESPONSE IN RECORDS.

JULY 1923 by PWSC. DOWNSTREAM FACE ROUGH AND UNEVEN, CORE-WALL LEANING DOWNSTREAM, WASTEWAY - POOR, DISINTEGRATING. MARSHY AT LOWER TOE. POOR DESIGN AND POOR CONSTRUCTION. REPAIRS MADE TO RIGHT SPILLWAY ABUTMENT BUT WALL HAS NOT BEEN (ILLEGIBLE) HIGH ENOUGH. REPAIRS WILL BE MADE TO LEFT WALL IN NEAR FUTURE. REPAIRS (ILLEGIBLE) DONE TO DOWNSTREAM SIDE OF SPILLWAY IN WHICH SOME OF THE LARGER HOLES WERE FILLED WITH ROCK AND MORTAR CONCRETE POSTS AND IRON PIPES IN SPILLWAY. NOTES THAT MR. BRYANT APPEARS TO WANT THE DAM IN GOOD REPAIR. SOME <u>MINOR</u> REPAIRS HAVE BEEN MADE SINCE LAST INSPECTION. PWSC INSPECTOR SUGGESTED THAT NEW WALLS BE BUILT AT THE SPILLWAY AND

THAT THE SECTION OF CORE WALL EXTENDING ABOVE THE TOP OF THE dam be REMOVED.

1924 by OWNER No DEFICIENCIES, good CONDITION, SPILLWAY being REPAIRED.

1924 by DER. DAM CREST UNEVEN, UPSTREAM FACE UNEVEN. UPSTREAM FILL HAS SETTLED AND APPEARS TO be ABOUT A FOOT LOWER THAN THE downSTREAM FILL THRU THE MIDDLE SECTION OF THE dam. CONSIDERABLE LEAKAGE. SIDE WALLS OF SPILLWAY APRON NEARLY ALL GONE AND WATER FLOWS THRU ROCK FILL AT SIDES OF APRON. OUTLET LEAKS. LOWER TOE SWAMPY. PICKS AND SIDES FOR FLASHBOARDS IN SPILLWAY. THERE IS A CONCRETE SLUICE 18" WIDE AND 3' deep THRU THE TOP OF THE dam. UPSTREAM FILL HAS SETTLED NEAR THE SPILLWAY AND HAS been REPAIRED by FILLING WITH ROCK.

MAY 1926 by DER. DAM CREST UNEVEN, DOWNSTREAM FACE STEEP AND UNEVEN. SETTLEMENT: UPSTREAM PORTION 2'± below TOP OF CORE-WALL. The CORE WALL IN THIS dam LEANS downSTREAM AND THE ROCK FILL ON THE downSTREAM SIDE APPEARS TO HAVE MOVED. THERE IS MORE OR LESS LEAKAGE. WATER CAN be HEARD RUNNING THROUGH THE UPSTREAM FILL AND THROUGH THE CORE-WALL NEAR THE MIDDLE. IT WAS SUGGESTED TO THE SUPERINTENDENT, . . . , THAT ADDITIONAL EARTH be ADDED TO THE UPSTREAM SIDE, FIRST REMOVING THE ROCK AND UNCOVERING THE ORIGINAL EARTH FILL AND THEN REPLACING THE ROCK, AND THAT ADDITIONAL ROCK FILL be ADDED TO THE downSTREAM SIDE WITH A TOP WIDTH OF FROM 6 TO 7 FEET.

Repairs ORDERED JUNE 1926
Repairs ORDERED NOVEMBER 1926

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT _____ FILE NO. _____
SHEET NO. 4 OF _____ SHEETS
FOR _____
COMPUTED BY _____ DATE _____ CHECKED BY _____ DATE _____

Repairs ordered January 1927

October 1927 Crest of dam uneven, upstream face uneven, downstream face uneven, Settlement is not visible on both upstream and downstream sides. Spillway, abutments fair. Flash board supports in spillway. Wasteway channel O.K. except at downstream end where there is some undermining. Considerable leakage. Note: Discussed repairs with Mr. Bryant and suggested the removal of piers and pipes from the spillway, and that the downstream rock fill be widened and raised, and that the slope be flattened. The concrete cutoff wall appears to lean more than when last examined.

August 1928 Crest of dam uneven, upstream face poor. Downstream face uneven, steep. Considerable settlement on the upstream and downstream sides of the core-wall which has been pushed downstream 1 foot or more at the top and is decidedly out of plumb thru the central portion of the dam. Considerable leakage thru the entire length of the dam. Outlets leak, lower toe swampy. Right spillway abutment wall upstream of the cutoff tipped over; the left one is in fair condition. Flash board supports and a portion of the right upstream spillway abutment are in the spillway.

Repairs called for August 1928, noting no action on previous orders.

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GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT _____ FILE NO. _____
SHEET NO. 5 OF ____ SHEETS
FOR _____
COMPUTED BY _____ DATE _____ CHECKED BY _____ DATE _____

September 1928 DER met with Mr. Bryant & Mr. Williams at the dam. They were requested to widen the downstream rock fill so that it would be 8' wide at top with a downstream slope of 1V on 2H. Messrs Bryant thought this could be done during the winter by drawing the stone from a nearby hillside down to the pond and over the ice to the dam.

November 1929 by DER. There is some leakage through the outlet at the right of the spillway. The lower toe is wet and swampy. The dam crest is narrow and low and part of the core wall, through the central section of the structure, has fallen over and been removed. The downstream slope is too steep. Part of the work previously recommended has been done, but in a very unsatisfactory manner; stone having been piled up to obtain the top width and making the downstream slope steeper instead of flatter as was recommended. There is some leakage at the left of the spillway, a heavy leak about 60 feet to the right of the spillway and some leakage at about 100 feet to the right of the spillway. The spillway abutment walls have been repaired and are in fair condition but they have not been built to a height that would prevent water from flowing over them and changing the

8513

EMBANKMENT. THERE ARE TWO VERTICAL PIPES ON THE SPILLWAY CREST WHICH APPARENTLY WERE INTENDED TO SUPPORT FLASHBOARDS. THE LOWER END OF THE SPILLWAY APRON SHOULD BE PROTECTED BY RIPRAP.

REPAIRS ORDERED NOVEMBER 1929
REPAIRS AGAIN ORDERED DECEMBER 1929
LETTER MR. BRYANT TO DER - DECEMBER 1929
"... THE DAM HAS BEEN DRAINED AND WORK DONE ON THE INSIDE BY CONCRETING CREVICES AND FILLING IN WITH DIRT, I WAS NOT ASKED TO DO. HOWEVER, IF THE SLOPE IS TO STEEP ON THE OUTSIDE, NOT WIDE ENOUGH ON TOP I WILL DO THAT THIS WINTER."
LETTER DER TO MR. BRYANT - JANUARY 1930
REITERATED 8 FOOT TOPWIDTH AND 1V ON 2H SLOPE FOR ROCKFILL.

JULY 1931 by DER. SETTLEMENT: THERE MUST HAVE BEEN CONSIDERABLE SHOVING DOWNSTREAM. 9" FLASHBOARDS IN SPILLWAY. OUTLET LEAKS. THE CREST (OF DAM) IS NARROW; THE TOP OF THE ROCK FILL BELOW THE CORE BEING ONLY 4 OR 5 FEET WIDE. THE TOP OF THE CREST WALL IS TIPPED BADLY DOWNSTREAM. THE DOWNSTREAM FACE IS TOO STEEP (ABOUT 1V ON 1.25H). NOTHING HAS BEEN DONE TO FLATTEN IT. THERE IS SOME LEAKAGE TO THE LEFT OF THE SPILLWAY AND THRU OUTLET TO RIGHT OF SPILLWAY; HEAVY LEAK UNDER HIGH SECTION AT MIDDLE; SMALL LEAK AT PIPE TOWARD RIGHT END. NOTE: MR. BRYANT

HAS DUMPED ADDITIONAL STONES ON TOP OF THE DOWNSTREAM FILL TWICE, AND MAY ADD MORE.

REPAIRS ORDERED JULY, 1931 AND THREATENING LEGAL ACTION IF NOT ACCOMPLISHED.

LETTER MR. BRYANT TO DER, JULY 1931, NOTING HE "HAD HUDED STONE TO THIS DAM THREE DIFFERENT TIMES AS PER THE REQUEST OF A DIFFERENT INSPECTOR EACH TIME ON THE JOB. I AM WORKING ON THE DAM NOW AND ....."

November 1931 by DER (IN MEMO) CONSIDERABLE ROCK HAS BEEN ADDED THIS SEASON TO THE DOWNSTREAM FILL. THE TOP WIDTH OF THE ROCK DOWNSTREAM FROM THE CORE WALL IS NOW ABOUT 6' NEAR THE SPILLWAY WITH A 1V ON 2H SLOPE, AND ABOUT 7 FEET NEAR THE ICE HOUSE WITH A 1V ON 1.25H SLOPE. FOR THE FULL TOPWIDTH OF DAM, INCLUDING THE UPSTREAM FILL AND CORE WALL, ABOUT 5 FEET MORE MAY BE ADDED, MAKING THE TOTAL TOPWIDTH 11 TO 12 FEET.

October 1932 by DER. "IT did NOT APPEAR THAT ANY WORK HAD BEEN done SINCE THE LAST EXAMINATION, AND THE SLOPE OF THE DOWNSTREAM EARTHFILL IS STILL TOO STEEP. ...."

REPAIRS ORDERED October 1932
LETTER FROM MR. BRYANT TO DER
October 1932
(ON NEXT SHEET)

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT _____ FILE NO. _____
SHEET NO. 8 OF _____ SHEETS
FOR _____
COMPUTED BY _____ DATE _____ CHECKED BY _____ DATE _____

"OF FOUR CLAIMS THAT I LEASE THIS ONE IS IN THE BEST SHAPE. I WILL GET SOME MEN WHEELING ROCK AT THE STEEPEST PLACE ALTHOUGH I DON'T KNOW WHAT TO PAY THEM WITH. I KEEP THE WATER LEVEL LOWER. THERE IS ONLY ONE FAMILY LIVING BELOW AND THEY ARE ON MY FARM, THE REST IS OWNED BY THE WATER COMPANY AND WASTE LAND.

ROCK IS SCARCE ON THIS FARM AND THAT SLOPE SEEMS TO TAKE AN AWFUL LOT. WILL STOP SOME DAY AT CAPITOL AND GO OVER THINGS, MEAN WHILE WILL GET DONE WHAT I CAN."

October 1933 by DER (MEMO) "MR. BRYANT SAID THAT HE HAD A FARMER HAULING STONE ONTO THE DOWNSTREAM SIDE OF THIS DAM FOR TWO MONTHS THIS SEASON, BUT THE WRITER WOULD SCARCELY HAVE KNOW IT FROM ITS APPEARANCE." TOP WIDTH OF ROCKFILL IS GENERALLY LESS THAN 6'. SLOPE IS STILL 1V ON 1.25H IN PLACES. NOTED RECENT OVERTOPPING TO DEPTH OF 6". NO HARM FROM OVERTOPPING EXCEPT SLIGHT SETTLEMENT OF THE CREST OF THE ROCKFILL. LOWEST STEP OF SPILLWAY BROKEN AWAY AT RIGHT END, STREAM FLOWING BELOW THIS WASHED AWAY." MR. BRYANT SAID THAT HE WOULD HAVE THE SPILLWAY REPAIRED AND WOULD CONTINUE TO ADD STONE FILL AS THE OPPORTUNITY OFFERED".

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AUGUST 1934 by DER (Memo) Spillway has been repaired. Part of the crest wall leaning. Ice house is tipped over." Mr Bryant said that he pushed it over with his foot; this wall serves no purpose anyway." No more rock added to downstream slope.

DECEMBER 1935 by DER Upstream face uneven and low. The rockfill on the downstream face was never built up to the crest of the dam. There is general settlement of the embankment and rockfill. Considerable leakage. The top of the core wall throughout most of the length is leaning downstream, and about 200 feet of it has fallen over.

The right abutment of the spillway is leaning into the spillway. Flashboards in spillway.

Repairs ordered January 1936.

JUNE 1938 by DER (MEMO). Structure "about the same condition as previously" except the flashboards have been removed. Notes construction of 2 sluices. "Mr. Bryant said he has added stone to the downstream face from time to time, and does not feel he can entail any further expense."

JULY 1952 by DER and PFC (Memo) "Complete disrepair". Core wall cracked at 6'-10' centers. Portion of wall above embankment, about 4 feet, has fallen at several points. The entire embankment leaks extensively and water can be heard running through the structure.

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT _____ FILE NO. _____
SHEET NO. 10 OF _____ SHEETS
FOR _____
COMPUTED BY _____ DATE _____ CHECKED BY _____ DATE _____

MAY 1964 by DER. CORE WALL LEANS AT ABOUT 30-45° ANGLE. SPILLWAY ABUTMENT CONCRETE CRACKED AND BROKEN. LEAKAGE AT LOWER TOE.

October 1975 by DER (MEMO). "DURING STORM ELOISE A PORTION OF THE CONCRETE WALL BROKE OFF AND FELL DOWNSTREAM. THIS ..... IN REALITY ADDS LENGTH TO THE SPILLWAY SINCE THE BREAK IS AT SPILLWAY GRADE. The CONCRETE THAT BROKE OFF IS ACTING AS A SCOUR PAD."

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SUSQUEHANNA RIVER BASIN

HARVEYS CREEK, LUZERNE COUNTY

PENNSYLVANIA

BRYANT POND DAM

NDI ID No. PA-00544
DER ID No. 40-11

ESTATE OF GLENDORA BRYANT

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

JULY 1979

APPENDIX B

CHECKLIST - VISUAL INSPECTION

CHECKLIST

VISUAL INSPECTION

PHASE I

Name of Dam: BRYANT POND County: LUZERNE State: PENNSYLVANIA

NDI ID No.: PA-00544 DER ID No.: 40-11

Type of Dam: EARTHFILL AND ROCKFILL W/ CONCRETE CORE-WALL Hazard Category: HIGH

Date(s) Inspection: 11 JUNE 1979 Weather: HAZY - OCCASIONAL LIGHT RAIN Temperature: 60°F

SOIL CONDITIONS - MOIST

Pool Elevation at Time of Inspection: 1105.3 msl/Tailwater at Time of Inspection: 1093.2 msl

Inspection Personnel:

B. BRYANT (OWNER)

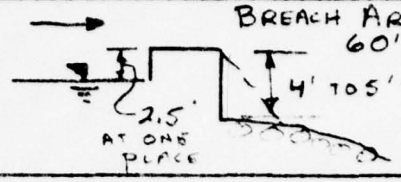
D. WILSON (GFCC)

D. EBERSOLE (GFCC)

A. WHITMAN (GFCC) Recorder

EMBANKMENT

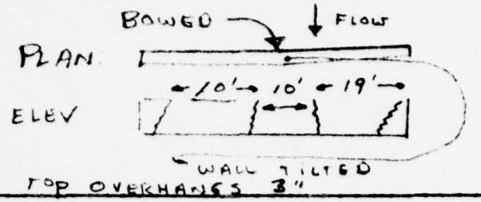
Sheet 1 of 2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	1'x2'x6" depression in BREACH AREA	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	TYPICAL CROSS SECTION EXCEPT AT BREACH AREA:	
SLOUGHING OR EROSION: Embankment Slopes Abutment Slopes		WASHOUT
CREST ALIGNMENT: Vertical Horizontal	HORIZONTAL - NO OBSERVED DEFICIENCIES VERTICAL - SEE SURVEY DATA FOLLOWING INSPECTION FORM	
RIPRAP FAILURES	UNPROTECTED UPSTREAM SLOPE.	

B-2

EMBANKMENT

Sheet 2 of 2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT WITH: Abutment Spillway Other Features	LEFT ABUTMENT BEYOND SPILLWAY → RIGHT ABUTMENT NO DEFICIENCIES	
ANY NOTICEABLE SEEPAGE	SEE PLATE B-1	
STAFF GAGE AND RECORDER	NONE	
DRAINS	NONE	
BRUSH	ON UPSTREAM SLOPE EXCEPT BREACH AREA AND AT RIGHT ABUTMENT OF DOWNSTREAM SLOPE	

OUTLET WORKS

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	APPEARS LIKE DRY MASONRY. FLOW IN SPILLWAY VISIBLE THROUGH LEFT CONDUIT WALL	
INTAKE STRUCTURE	FOUR SHEARED COLUMNS IN RESERVOIR IS ALL THAT REMAINS.	
OUTLET STRUCTURE	FREE OUTFALL 1 CFS FLOW FROM RIGHT CONDUIT	
OUTLET CHANNEL	NATURAL STREAM	
EMERGENCY GATE	INOPERABLE	OWNER REPORTED PREVIOUS ATTEMPT AT PLUGGING CONDUITS NOT ENTIRELY SUCCESFUL.

B-4

UNGATED SPILLWAY

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	UNEVEN - SEE SURVEY DATA FOLLOWING INSPECTION FORMS.	
APPROACH CHANNEL	RESERVOIR	
DISCHARGE CHANNEL	CASCADE - CONCRETE SLABS, JAGGED AT EDGES AND CRACKED THROUGH.	
BRIDGE AND PIERS	NONE	

B-5

INSTRUMENTATION

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	NONE	
OBSERVATION WELLS	NONE	
WEIRS	NONE	
PIEZOMETERS	NONE	
OTHER	NONE	

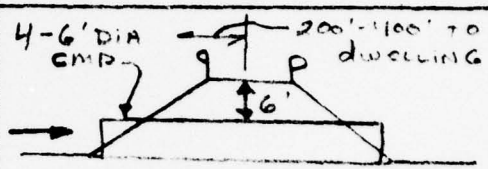
RESERVOIR AND WATERSHED

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	ROLLING HILLS SOME SWAMPS	
SEDIMENTATION	OWNER REPORTS SIGNIFICANT SEDIMENT AFTER TROPICAL STORM AGNES	
WATERSHED DESCRIPTION	BELOW HARVEYS LAKE DAM: WOODED MINOR DEVELOPMENT	FOR HARVEYS LAKE DAM SEE APPENDIX C

DOWNSTREAM CHANNEL

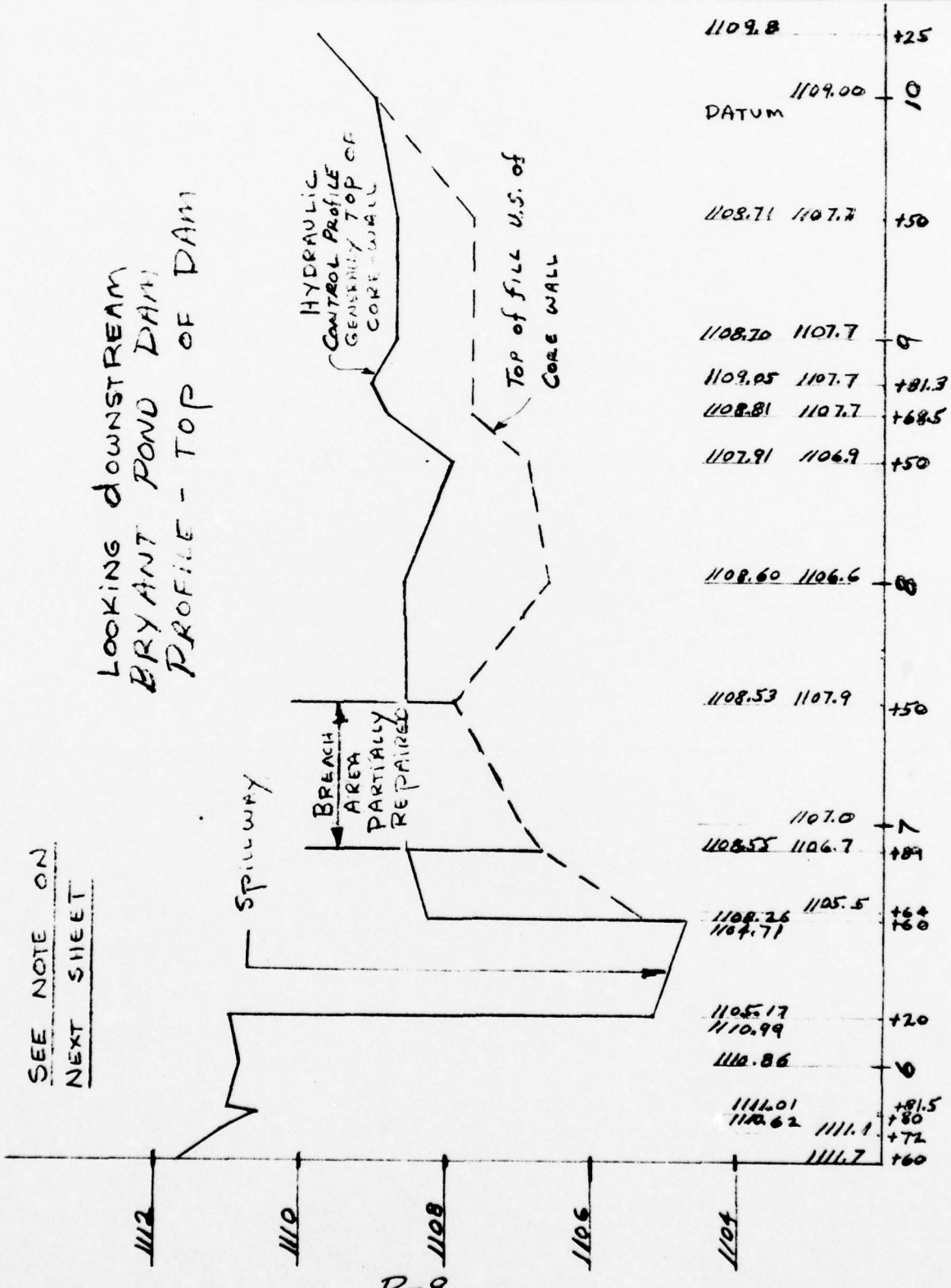
Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION: Obstructions Debris Other	SMALL BRIDGE 200' downstream	NEGLIGIBLE
SLOPES	FAIRLY MILD	
APPROXIMATE NUMBER OF HOMES AND POPULATION	1 RECENTLY CONSTRUCTED home UPSTREAM OF ROADWAY EMBANKMENT AT RIGHT	
CONTINUED	DOWNSTREAM OF ABOVE EMBANKMENT ABOUT 5 HOMES ON LEFT BANK - FAIRLY HIGH.	
	ALSO downstream is HARVEYS CREEK CANAL DIVERSION STRUCTURE	OWNED by PENNSYLVANIA GAS AND WATER.

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT BRYANT POND DAM FILE NO. 7826
SHEET NO. 1 OF 1 SHEETS
FOR USCE 1981 INSPECTION
COMPUTED BY DAC DATE CHECKED BY DATE

LOOKING DOWNSTREAM
BRYANT POND DAM
PROFILE - TOP OF DAM

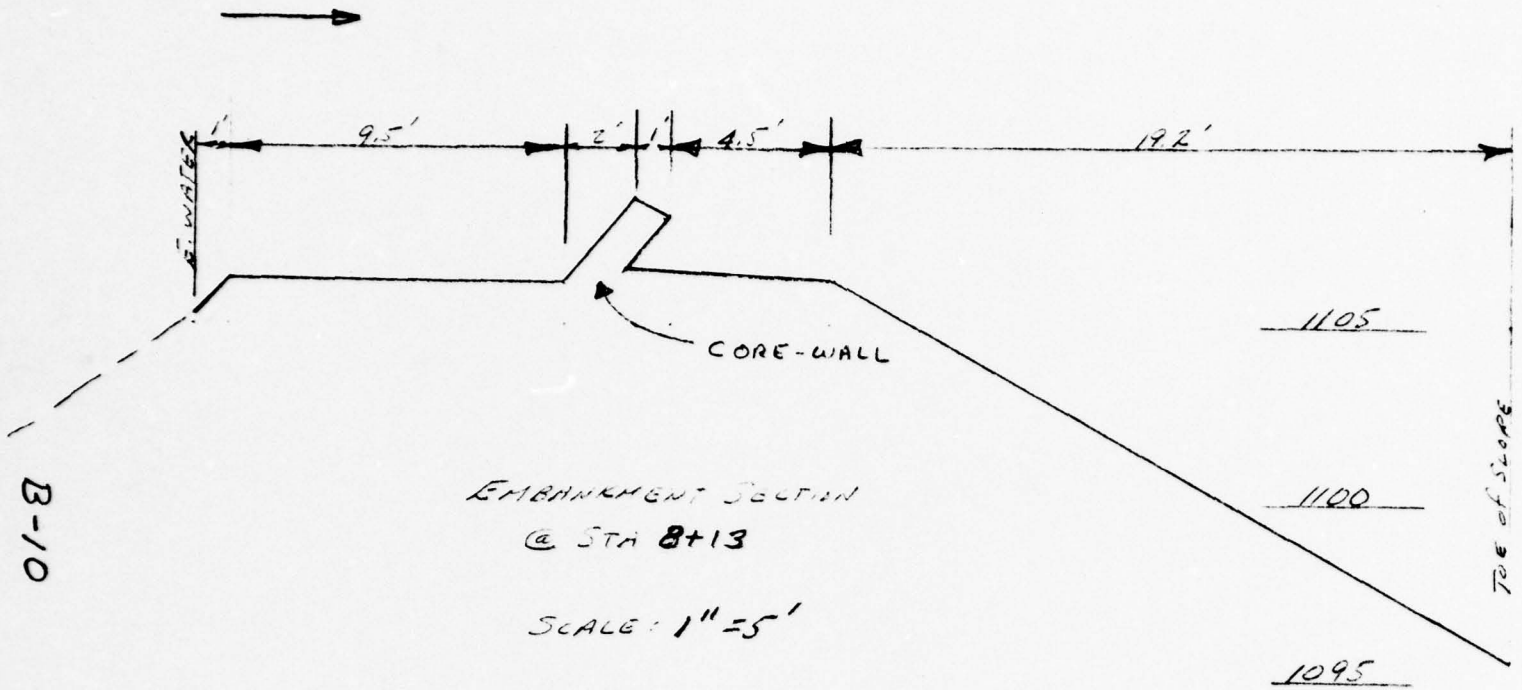


B-9

6315

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT Bryant Pond Dam FILE NO. 7822
FOR Base Elevation SHEET NO. 1 OF 1 SHEETS
COMPUTED BY DATE CHECKED BY DATE



EMBANKMENT SECTION
@ STA 8+13

SCALE: 1" = 5'

B-10

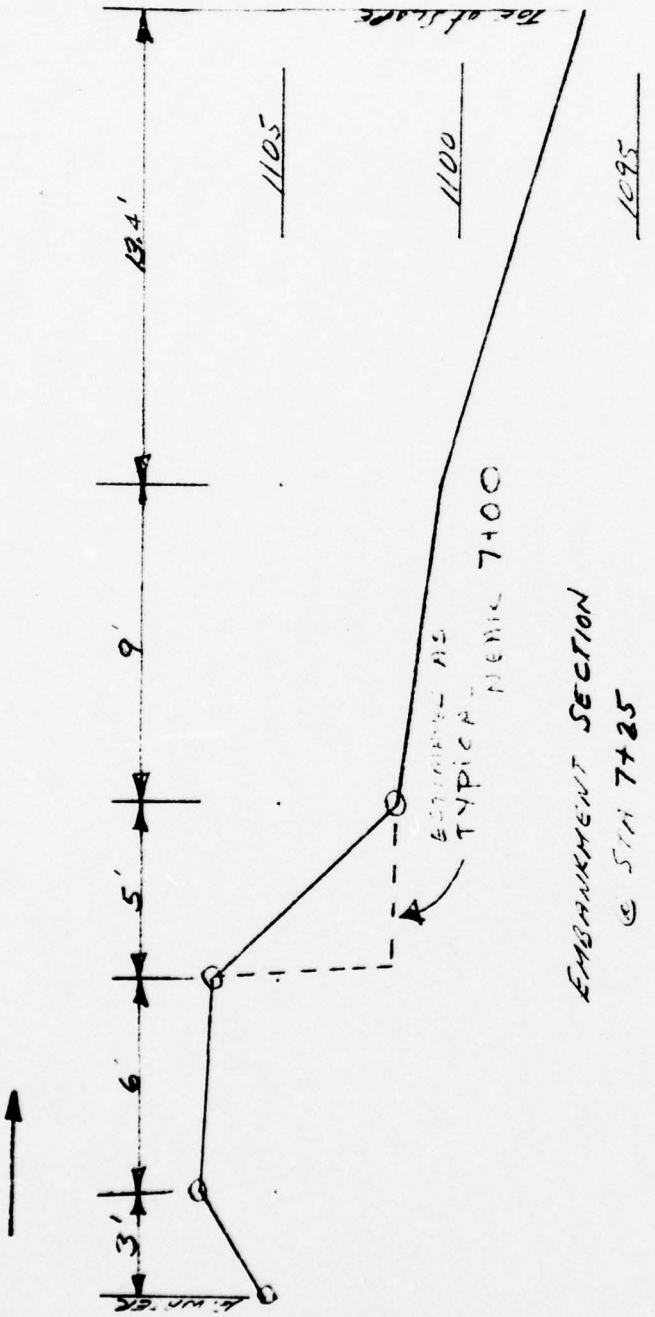
BRYANT POND DAM.

DATUM FOR PLATE 5 IS UNKNOWN

NOTE: There is NO RELIABLE DATUM AT THE DAM. TO CORRELATE THE SURVEY DATA WITH THE PLATES, IT WAS ASSUMED THAT THE HIGH POINT OF THE SPILLWAY, EL 1105.17 = EL 92.0 ON PLATES

GANNETT FLEMING CORDDRY
AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT BRYANT POND DAM FILE NO. 7322
SHEET NO. 1 OF 1 SHEETS
FOR CIVIL - DAM INSPECTION
COMPUTED BY DATE CHECKED BY DATE



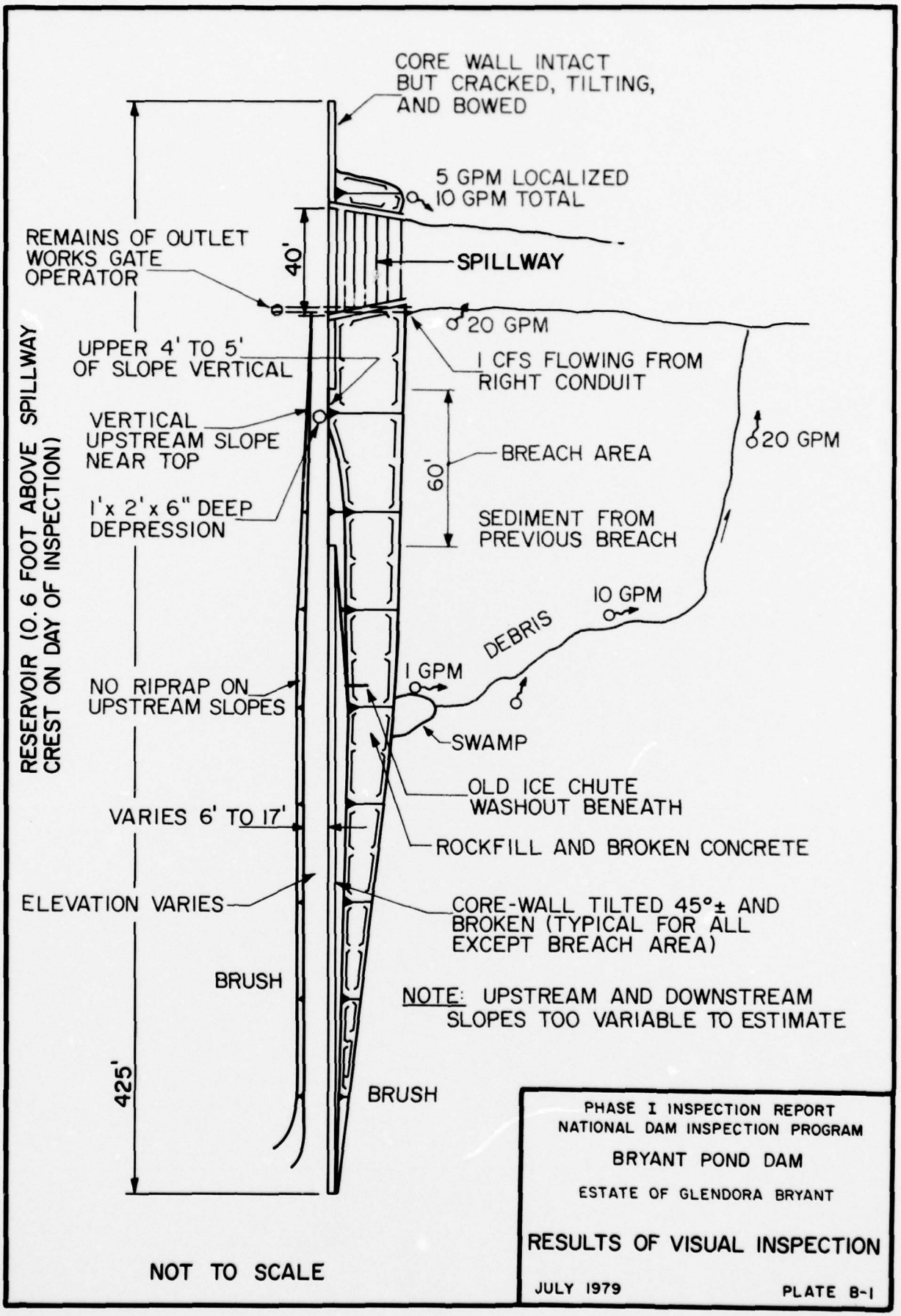
EMBANKMENT SECTION
@ STA 7+25

SCALE: 1" = 5'

BRYANT POND DAM

B-11

6513



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

BRYANT POND DAM

ESTATE OF GLENDORA BRYANT

RESULTS OF VISUAL INSPECTION

JULY 1979

PLATE B-1

SUSQUEHANNA RIVER BASIN

HARVEYS CREEK, LUZERNE COUNTY

PENNSYLVANIA

BRYANT POND DAM

NDI ID No. PA-00544
DER ID No. 40-11

ESTATE OF GLENDORA BRYANT

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

JULY 1979

APPENDIX C

HYDROLOGY AND HYDRAULICS

APPENDIX C

HYDROLOGY AND HYDRAULICS

In the recommended Guidelines for Safety Inspection of Dams, the Department of the Army, Office of the Chief of Engineers (OCE), established criteria for rating the capacity of spillways. The recommended Spillway Design Flood (SDF) for the size (small, intermediate, or large) and hazard potential (low, significant, or high) classification of a dam is selected in accordance with the criteria. The SDF for those dams in the high hazard category varies between one-half of the Probable Maximum Flood (PMF) and the PMF. If the dam and spillway are not capable of passing the SDF without overtopping failure, the spillway capacity is rated as inadequate. If the dam and spillway are capable of passing one-half of the PMF without overtopping failure, or if the dam is not in the high hazard category, the spillway capacity is not rated as seriously inadequate. A spillway capacity is rated as seriously inadequate if all of the following conditions exist:

(a) There is a high hazard to loss of life from large flows downstream of the dam.

(b) Dam failure resulting from overtopping would significantly increase the hazard to loss of life downstream from the dam from that which would exist just before overtopping failure.

(c) The dam and spillway are not capable of passing one-half of the PMF without overtopping failure.

APPENDIX C

SUSQUEHANNA River Basin

Name of Stream: HARVEYS CREEK

Name of Dam: BRYANT POND

NDI ID No.: PA-00544

DER ID No.: 40-11

Latitude: N 41° 19' 00" Longitude: W 76° 04' 15"

Top of Dam (low spot) Elevation: 1106.7

Streambed Elevation: _____ Height of Dam: _____ ft

Reservoir Storage at Top of Dam Elevation: _____ acre-ft

Size Category: SMALL

Hazard Category: HIGH (see Section 5)

Spillway Design Flood: VARIES ½ PMF TO PMF

USE ½ PMF BECAUSE OF SMALL DOWNSTREAM POPULATION.

UPSTREAM DAMS

Name	Distance from Dam (miles)	Height (ft)	Storage at top of Dam Elevation (acre-ft)	Remarks
HARVEYS LAKE	0.7 ALONG STREAM	3±	N/A	NATURAL LAKE

DOWNSTREAM DAMS

PENNSYLVANIA GAS & WATER HARVEYS CREEK CANAL DIVERSION STRUCTURE				IGNORED IN HYDROLOGY

SUSQUEHANNA River Basin

Name of Stream: HARVEY'S CREEK

Name of Dam: BRYANT POND

~~NDS ID No.~~: _____

~~DER ID No.~~: _____

Latitude: N 41° 19' 00" Longitude: W 76° 04' 15"

DETERMINATION OF PMF RAINFALL

For Area A

which consists of Subareas A1 of 6.62 sq. mile

A2 7.6

_____ _____

_____ _____

_____ _____

Total Drainage Area 14.22 sq. mile

PMF Rainfall Index = 22.15 in., 24 hr., 200 sq. mile

	Hydromet. 40 (Susquehanna Basin)	Hydromet. 33 (Other Basins)
Zone	N/A	N/A
Geographic Adjustment Factor	98%	1.0
Revised Index Rainfall	21.7	N/A

RAINFALL DISTRIBUTION (percent)

Time	Percent
6 hours	114
12 hours	123
24 hours	133
48 hours	139
72 hours	142
96 hours	N/A

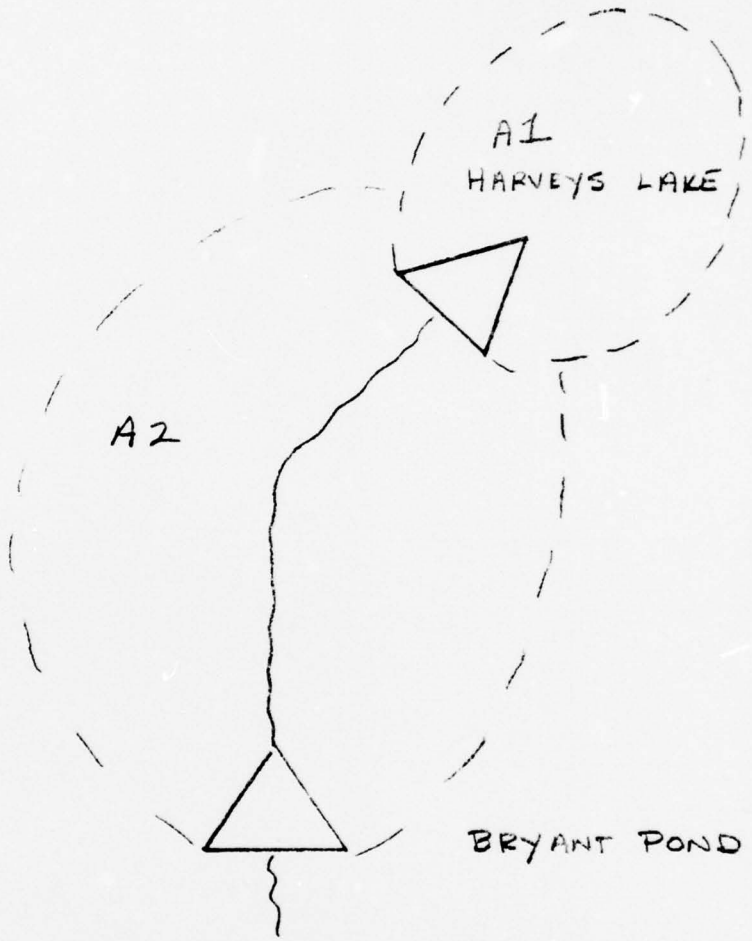
GANNETT FLEMING CORDDRY
AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT _____ FILE NO. _____

_____ SHEET NO. ____ OF ____ SHEETS

FOR _____

COMPUTED BY _____ DATE _____ CHECKED BY _____ DATE _____



SKETCH OF SYSTEM

FOR LOCATION OF
ROUTING SECTIONS,
SEE PLATE C-1

6315

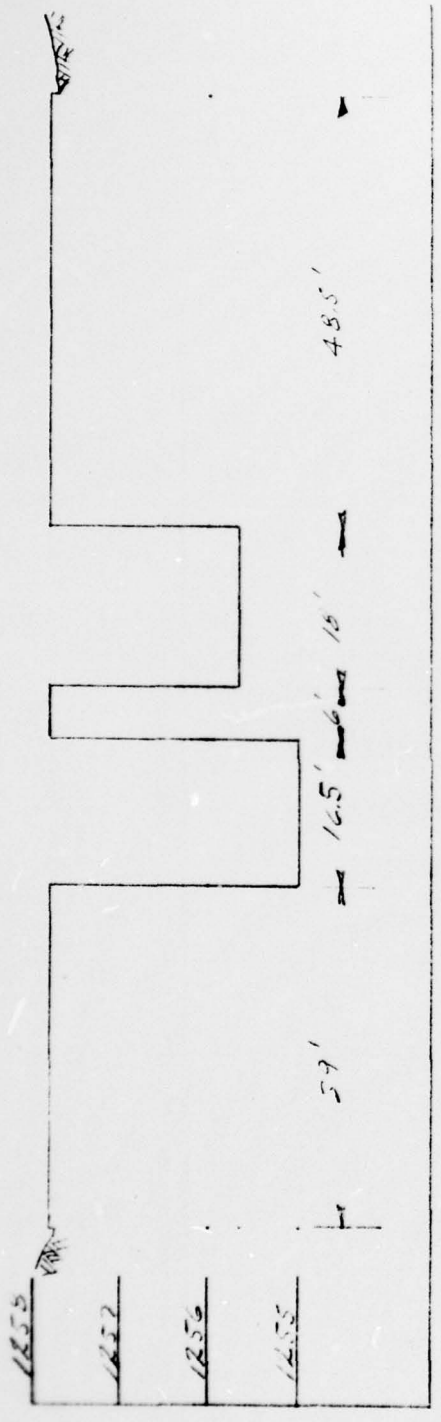
GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT HANCOCK'S LAKE DAM FILE NO. 7332

SHEET NO. 1 OF 1 SHEETS

FOR USCE "DAM" SECTION

COMPUTED BY _____ DATE _____ CHECKED BY _____ DATE _____

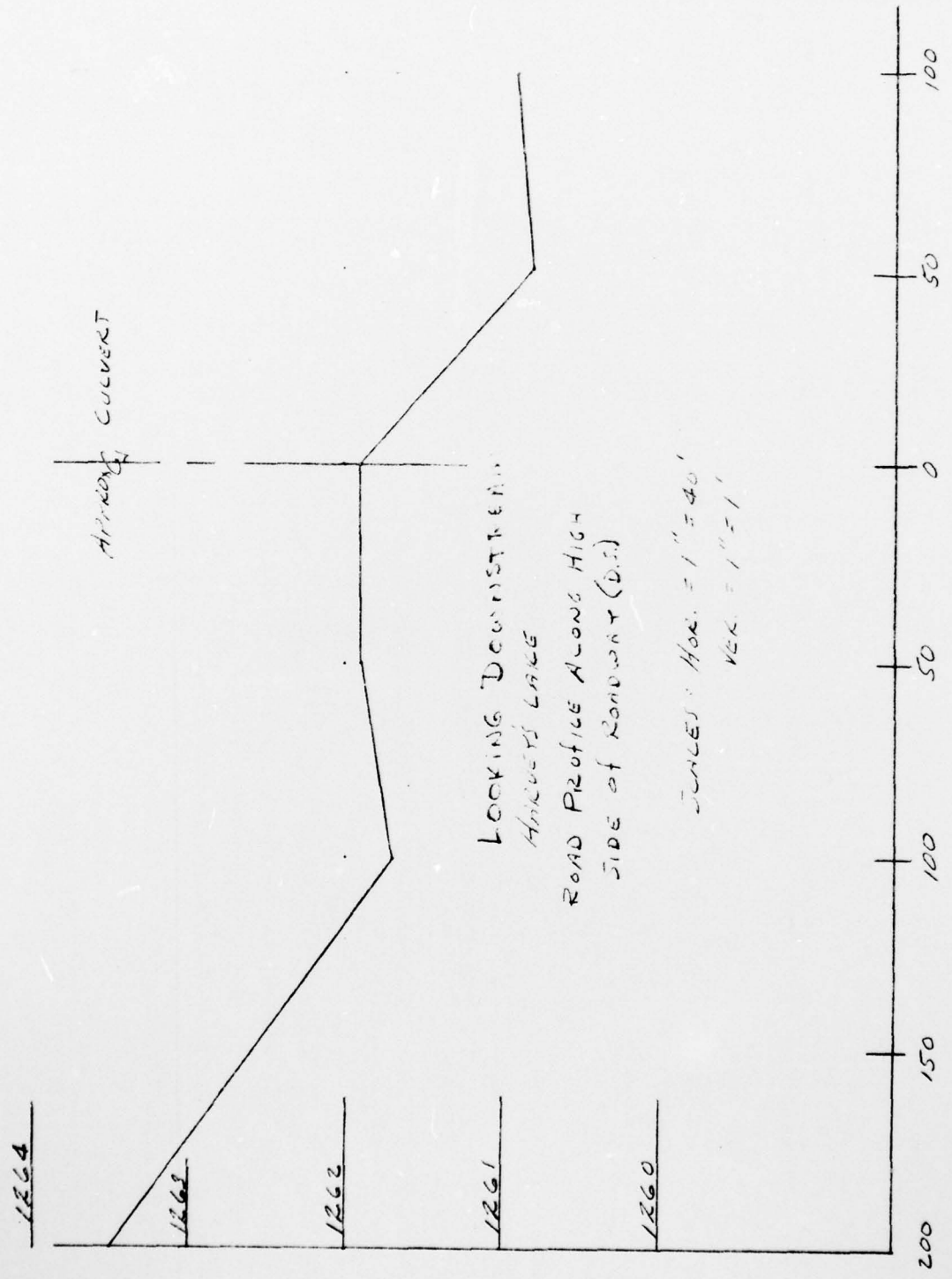


LOOKING UPSTREAM
HANCOCK'S LAKE DAM
PROFILE - TOP OF DAM
SCALES: HOR. - 1" = 20'
VER. - 1" = 2'

C-5

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT Profile D.S. of Harvard Mine Outlet FILE NO. 7832
SHEET NO. 1 OF 1 SHEETS
FOR USCE Dam Inspection
COMPUTED BY _____ DATE _____ CHECKED BY _____ DATE _____



Looking Downstream
Harvard Lake
Road Profile Along High Side of Roadway (D.S.)
Scales: Hor. 1" = 40'
Ver. 1" = 1'

6313

Data for Dam at Outlet of Subarea A1
(see Sketch on Sheet C-4)

Name of Dam: HARVEYS LAKE

Height: 3 FT ± (existing)

Spillway Data:	Existing Conditions	Design Conditions
Top of Dam Elevation	SEE NEXT 2 SHEETS	
Spillway Crest Elevation		
Spillway Head Available (ft)		
Type Spillway		
"C" Value - Spillway		
Crest Length - Spillway (ft)		
Spillway Peak Discharge (cfs)		
Auxiliary Spillway Crest Elevation		
Auxiliary Spillway Head Available (ft)		
Type Auxiliary Spillway		
"C" Value - Auxiliary Spillway		
Crest Length - Auxiliary Spillway (ft)		
Auxiliary Spillway Peak Discharge (cfs)		
Combined Spillway Discharge (cfs)		

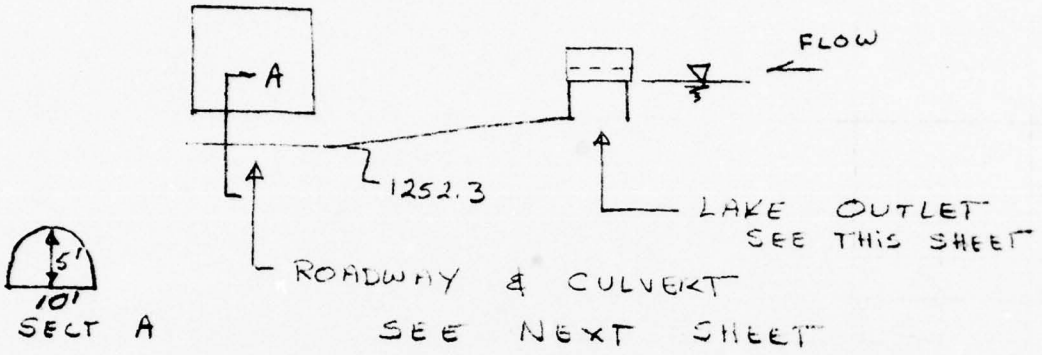
Spillway Rating Curve: FROM 2 FOLLOWING SHEETS

Elevation	Q Spillway (cfs)	Q Auxiliary Spillway (cfs)	Combined (cfs)
1255			0
1256			53
1257			198
1258			422
1259			491
1260			549
1261			691
1262			649
1263			694
1264			736

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

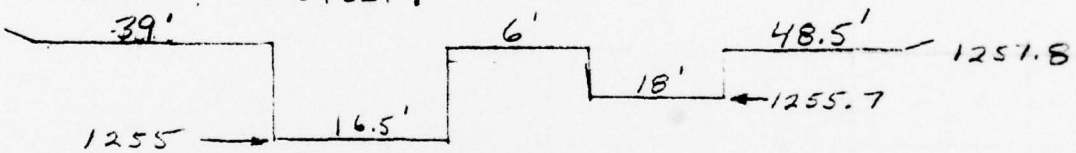
SUBJECT _____ FILE NO. _____
SHEET NO. ____ OF ____ SHEETS
FOR _____
COMPUTED BY _____ DATE _____ CHECKED BY _____ DATE _____

HARVEYS LAKE OUTLET



SECT A

LAKE OUTLET:



USE BROAD CRESTED WEIR C = 2.7

$Q = CLH^{1.5}$

$Q = 2.7\left(16.5 \times (POOL - 1255)^{1.5} + 18 \times (POOL - 1255.7)^{1.5} + 87.5 \times (POOL - 1257.8)^{1.5}\right)$

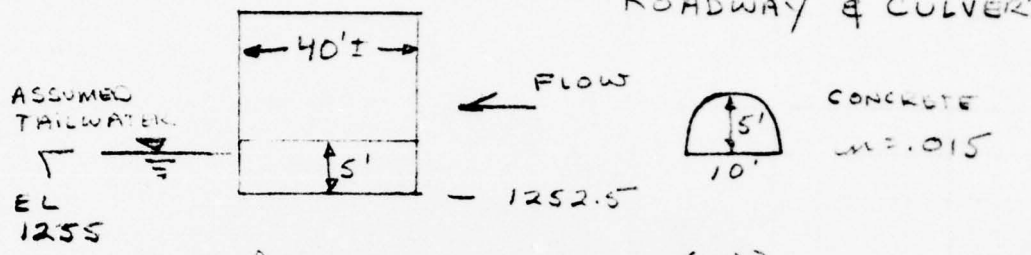
POOL	Q (CFS)
1255	0
1255.7	26
1256	53
1257	198
1257.8	357
1258	422
1259	958
1260	1702

8313

GANNETT FLEMING CORDDRY
AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT _____ FILE NO. _____
SHEET NO. ____ OF ____ SHEETS
FOR _____
COMPUTED BY _____ DATE _____ CHECKED BY _____ DATE _____

HARVEYS LAKE OUTLET
ROADWAY & CULVERT



$$\text{AREA CULVERT} = \frac{\pi (10)^2}{8} = 39.27 \text{ FT}^2$$

$$P = 5\pi + 10 = 25.71 \text{ FT}$$

$$R = A/p = 1.53 \text{ FT}$$

$$K_s = \frac{29.1\, n^2 L}{R^{4/3}} = .15$$

$K_{ENTRANCE} = 0.5$
$K_{EXIT} = 1.0$ $\quad \Sigma K = 1.65$

$$Q_{CULVERT} = A\sqrt{\frac{2gH}{\Sigma K}} = 39.27\sqrt{\frac{2gH}{1.65}}$$

$$= 245.3\sqrt{(Pool - 1255)}$$

NOTE: * INDICATES CONTROL

POOL	Q CFS CULVERT	Q CFS LAKE OUTLET
1255	0	0 *
1256	245	53 *
1257	347	198 *
1257.8	410	357 *
1258	425	422 *
1259	491 *	958
1260	549 *	1702
1261	601 *	N/A
1262	649 *	
1263	694 *	
1264	736 *	

Data for Dam at Outlet of Subarea A1

Name of Dam: HARVEYS LAKE

Storage Data:

Elevation	Area (acres)	Storage million gals	Storage acre-ft	Remarks
1146.4 = ELEVO*	0	0	0	
1255 = ELEV1	659 = A1	7773	23,856 = S1	
1260	702		27,258	
1280	1020		44,379	
**				

* ELEVO = ELEV1 - $(3S_1/A_1)$

** Planimetered contour at least 10 feet above top of dam

Reservoir Area at Top of Dam is 16 percent of watershed.

Remarks:

SUSQUEHANNA River Basin

Name of Stream: HARVEYS CREEK

Name of Dam: BRYANT POND

~~NDS ID No.~~: _____

~~DER ID No.~~: _____

Latitude: N 41° 19' 00" Longitude: W 76° 04' 15"

Drainage Area: 14.22 sq. mile

Data for Subarea: A1 (see Sketch on Sheet C-4)

Name of Dam at Outlet of Subarea: HARVEYS LAKE

Drainage Area of Subarea: 6.62 sq. mile

Subarea Characteristics:

Assumed Losses: 1.0-inch initial abstraction + 0.05 in/hr

The following are measured from outlet of subarea to the point noted:

L = Length of Main Watercourse extended to the divide = N/A mile

L_{CA} = Length of Main Watercourse to the centroid = N/A mile

From NAB Data: AREA 12, PLATE F

CENTROID FALLS IN LAKE

Cp = 0.30

C_T = 0.95

USE $Tp = C_T \times (L')^{0.6}$

Tp = ~~$C_T \times (L \times L_{CA})^{0.3}$~~ = 1.39 (hrs)

L' = LONGEST WATERCOURSE FROM DIVIDE TO LAKE = 1.88 mi

Flow at Start of Storm = 1.5 cfs/sq. mile x Subarea D.A = 9.9 cfs

Computer Data:

QRCSN = -0.05 (5% of peak flow)

RTIOR = 2.0

Remarks: _____

Data for Dam at Outlet of Subarea A2
(see Sketch on Sheet C-4)

Name of Dam: BRYANT POND

Height: _____ (existing)

Spillway Data:	Existing Conditions	Design Conditions
Top of Dam Elevation	1106.7	SEE TEXT
Spillway Crest Elevation	1104.7	
Spillway Head Available (ft)	2.0	
Type Spillway	BROAD CRESTED WEIR	
"C" Value - Spillway	2.7	
Crest Length - Spillway (ft)	40	
Spillway Peak Discharge (cfs)		
Auxiliary Spillway Crest Elevation	NONE	
Auxiliary Spillway Head Available (ft)	—	
Type Auxiliary Spillway	—	
"C" Value - Auxiliary Spillway	—	
Crest Length - Auxiliary Spillway (ft)	—	
Auxiliary Spillway Peak Discharge (cfs)	—	
Combined Spillway Discharge (cfs)	305	

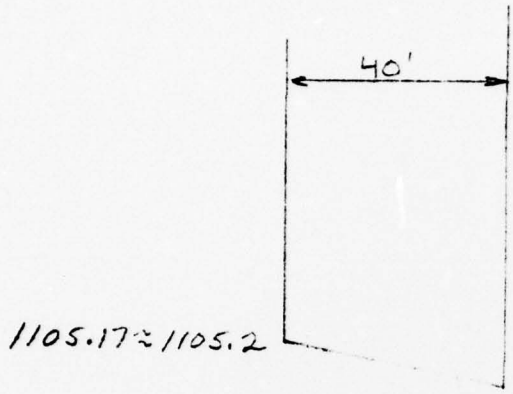
Spillway Rating Curve: SEE NEXT SHEET

Elevation	Q Spillway (cfs)	Q Auxiliary Spillway (cfs)	Combined (cfs)
1104.7			0
1105.3			25
1106.4			213
1107.1			381
1107.8			580
1109.1			1053
1110.5			1611
1114.7			3699
1117.4			5381
1125.71			11,539

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT _____ FILE NO. _____
SHEET NO. ____ OF ____ SHEETS
FOR _____
COMPUTED BY _____ DATE _____ CHECKED BY _____ DATE _____

Spillway Rating
Bryant Pond Dam



Adjusted critical depth

$$Q = \frac{2.7}{3.1}\sqrt{\frac{A^3 g}{T}}$$

d = depth
A = Area
T = Top width
g = 32.18
V = Velocity = $\frac{Q}{A}$
Q = Flow

hv = Velocity head = $\frac{V^2}{2g} = \frac{Q^2}{2gA^2}$

Pool = W.S. + hv W.S. = d + 1104.7

W.S	d	A	T	Q	hv	Pool
1104.7	0	0	N/A	0	0	1104.7
1105.2	.5	10	40	251	.09	1105.3
1105.5	.8	22	40	81	.21	1105.7
1106.0	1.3	42	40	213	.40	1106.4
1106.5	1.8	62	40	381	.59	1107.1
1106.7	2.0	70	40	458	.66	1107.4
1107.0	2.3	82	40	580	.78	1107.8
1108.0	3.3	122	40	1,053	1.12	1109.1
1109.0	4.3	162	40	1,611	1.54	1110.5
1110.0	5.3	202	40	2,243	1.92	1111.9
1112.0	7.3	282	40	3,699	2.67	1114.7
1114.0	9.3	362	40	5,381	3.43	1117.4
1120.0	15.3	602	40	11,539	5.71	1125.71

6313

Data for Dam at Outlet of Subarea A2

Name of Dam: BRYANT POND

Storage Data:

Elevation	Area (acres)	Storage million gals	Storage acre-ft	Remarks
1090.9 = ELEVO*	0	0	0	
1104.7 = ELEV1	18 = A1	27	83 = S1*	DER RECORDS IN ERROR
1106.7	19		120	INTERPOLATED
1110.2	22		193.	"
1120	30			
**				

* ~~ELEVO = ELEV1 - (0S$_1$/A$_1$)~~ * S_1 = HEIGHT OF SPILLWAY x RESERVOIR AREA / 3

** Planimetered contour at least 10 feet above top of dam

Reservoir Area at Top of Dam is NEGLIGIBLE percent of UNCONTROLLED watershed.

Remarks:

Data for Dam at Outlet of Subarea A2

Name of Dam: BRYANT POND

Breach Data:

Sketch of Dam Profile (not to scale):

SEE APPENDIX B
BREACH AREA - PARTIALLY REPAIRED

Sketch of Top of Dam (not to scale):

SEE APPENDIX B

Soil Type from Visual Inspection: CLAY

Maximum Permissible Velocity (Plate 28, EM 1110-2-1601) 2.5± fps
(from $Q = CLH^{3/2} = V \cdot A$ and depth = (2/3) x H) A = L · depth

HMAX = $(4/9\ V^2/C^2)$ = 0.29 ft., C = 3.1

0.3 1106.7
HMAX + Top of Dam Elev. = 1107.0 = FAILEL
(Above is elevation at which failure would start)

Dam Breach Data:

BRWID = 60 ft (width of bottom of breach)

Z = 0 (side slopes of breach)

ELBM = 1093.0 (bottom of breach elevation, minimum of zero storage elevation)

WSEL = 1104.7 (normal pool elevation)

T FAIL = 6 mins

= 0.1 hrs (time for breach to develop)

SUSQUEHANNA River Basin

Name of Stream: HARVEYS CREEK

Name of Dam: BRYANT POND

~~NDS ID No.~~: _____

~~DER ID No.~~: _____

Latitude: N 41° 19' 00" Longitude: W 76° 04' 15"

Drainage Area: 14.22 sq. mile

Data for Subarea: A2 (see Sketch on Sheet C-4)

Name of Dam at Outlet of Subarea: BRYANT POND

Drainage Area of Subarea: 7.6 sq. mile

Subarea Characteristics:

Assumed Losses: 1.0-inch initial abstraction + 0.05 in/hr

The following are measured from outlet of subarea to the point noted:

L = Length of Main Watercourse extended to the divide = 4.2 mile

L_{CA} = Length of Main Watercourse to the centroid = 1.2 mile

From NAB Data: AREA 12, PLATE F

Cp = 0.30

C_T = 0.95

$Tp = C_T \times (L \times L_{CA})^{0.3}$ = 1.54 (hrs)

Flow at Start of Storm = 1.5 cfs/sq. mile x Subarea D.A = 11.4 cfs

Computer Data:

QRCSN = -0.05 (5% of peak flow)

RTIOR = 2.0

Remarks: _____

SELECTED COMPUTER OUTPUT

* NOTE PLAN 1 = NO FAILURE
PLAN 2 = DAM BREACH

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
**********
    1              A1                        NATIONAL DAM INSPECTION  PROGRAM
    2              A2                                HARVEYS CREEK
    3              A3                              BRYANT POND DAM
    4              B    300       0      15       0       0       0       0       0      -4       0
    5              B1     5
    6              J      1       9       1
    7              J1     1      .5      .2      .15      .1     .07     .05     .03     .01
    8              K      0       1                                               1
    9              K1       RUNOFF INTO HARVEYS LAKE
   10              M      1       1    6.62              14.22                                   1
   11              P             21.7     114     123     133     139     142
   12              T                                                      1.0     .05             .16
   13              W   1.39     .30
   14              X   -1.5   -0.05     2.0
   15              K      1       1                                               1
   16              K1       ROUTE THROUGH HARVEYS LAKE (OUTLET COMB OF DAM & ROADWAY)
   17              Y                               1
   18              Y1     1                                                -1255      -1
   19              Y4  1255    1256    1257    1258    1259    1260    1261    1262    1263    1264
   20              Y5     0      53     198     422     491     549     601     649     696     736
   21              $A     0     659     702    1020
   22              $E1146.4    1255    1260    1280
   23              $$  1255
   24              $D1260.8
   25              $L     1      55      90     160     300     300
   26              $V1260.8  1260.9  1261.7  1261.9  1263.5    1270
   27              K      1       2                                               1
   28              K1       ROUTE  OUTFLOW HARVEYS LAKE  SECT 2
   29              Y                               1
   30              Y1     1                                                -1
   31              Y6   .09     .07     .09    1250    1270    1200   .00833
   32              Y7     0    1400     500    1300     650    1260     940    1250     950    1250
   33              Y7  1220    1260    1490    1300    1990    1400
   34              K      1       3                                               1
   35              K1       ROUTE OUTFLOW HARVEYS LAKE SECT 3
   36              Y                               1
   37              Y1     1                                                -1
   38              Y6   .09     .07     .09    1240    1260    2850    .0105
   39              Y7     0    1400     350    1300     420    1260     490    1240     510    1240
   40              Y7   600    1260     750    1300    1090    1400
   41              K      1       4                                               1
   42              K1       ROUTE OUTFLOW HARVEYS LAKE SECT 4
   43              Y                               1
   44              Y1     1                                                -1
   45              Y6   .09     .07     .09    1153    1180    5850    .016
   46              Y7     0    1260     400    1180     500    1160     600    1153     630    1153
   47              Y7   760    1160     840    1180    1300    1260
   48              K      1       5                                               1
   49              K1       ROUTE OUTFLOW HARVEYS LAKE SECT 5
   50              Y                               1
```

B

C-18

AD-A078 869 GANNETT FLEMING CORDDRY AND CARPENTER INC HARRISBURG PA F/G 13/13
NATIONAL DAM INSPECTION PROGRAM. BRYANT POND DAM (NDI I.D. NUMB--ETC(U)
JUL 79 F FUTCHKO DACW31-79-C-0015

UNCLASSIFIED NL

2 OF 2
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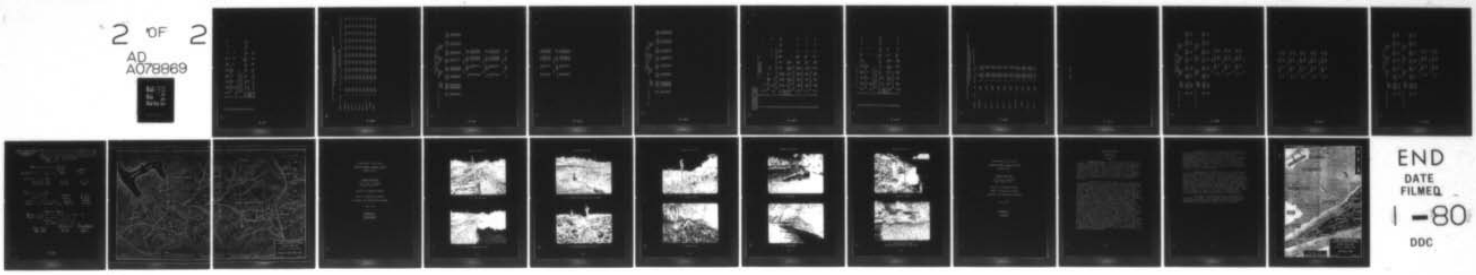
A078869



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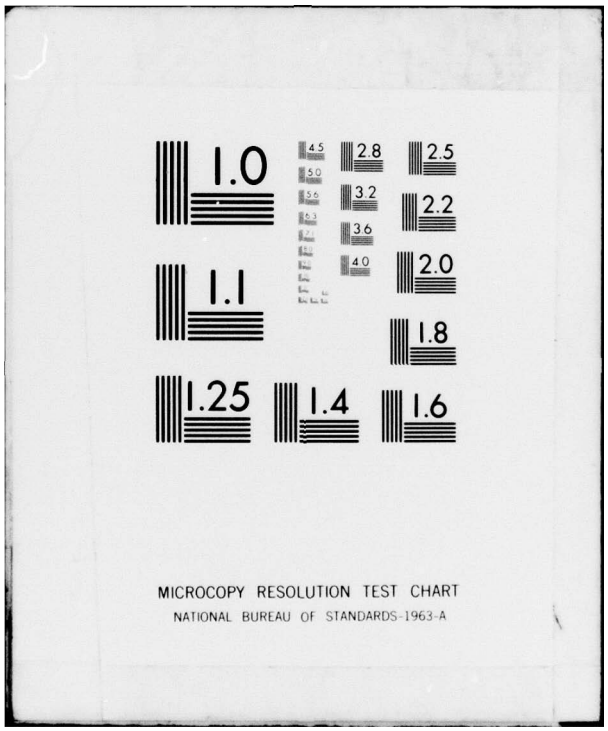
1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
6.3
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

```
51        Y1    1                                                    -1
52        Y6  .09     .07     .09    1120    1140    4500   .0125
53        Y7    0    1200     200    1160     280    1140     400    1120     500    1120
54        Y7  780    1140     920    1160    1200    1200
55        K     0       5                                           1
56        K1      UNCONTROLLED RUNOFF INTO BRYANT POND
57        M     1       1     7.6           14.22                                      1
58        P           21.7     114     123     133     139     142
59        T                                                        1.0     .05
60        W   1.54    0.30
61        X  -1.5   -0.05     2.0
62        K     2       5
63        K1      COMBINE INFLOW TO BRYANT POND
64        K     1       6                                           1
65        K1      ROUTE THROUGH BRYANT POND
66        Y                       1
67        Y1    1                                                -1104.7    -1
68        Y4 1104.7  1105.3  1106.4  1107.1  1107.8  1109.1  1110.5  1114.7  1117.4  1125.7
69        Y5    0      25     213     381     580    1053    1611    3699    5381   11539
70        $A    0      18      30
71        $E1090.9  1104.7    1120
72        $S1104.7
73        $D1106.7
74        $L    1      62      77     118     206     340     365     365
75        $V1106.7  1107.9  1108.3  1108.6  1108.7    1109    1111    1120
76        K    99
```

C-19

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 1.00	RATIO 2 .50	RATIO 3 .20	RATIO 4 .15	RATIO 5 .10	RATIO 6 .07	RATIO 7 .05	RATIO 8 .03	RATIO 9 .01
HYDROGRAPH AT	1	6.62	1	12340.	6170.	2468.	1851.	1234.	864.	617.	370.	123.
		(17.15)		(349.43)(	174.72)(	69.89)(	52.41)(	34.94)(	24.46)(	17.47)(	10.48)(	3.49)
ROUTED TO	1	6.62	1	2773.	544.	210.	136.	65.	40.	29.	17.	6.
		(17.15)		(78.52)(	15.41)(	5.95)(	3.85)(	1.83)(	1.14)(	.82)(	.49)(	.16)
ROUTED TO	2	6.62	1	2772.	544.	210.	136.	65.	40.	29.	17.	6.
		(17.15)		(78.50)(	15.41)(	5.95)(	3.85)(	1.83)(	1.14)(	.82)(	.49)(	.16)
ROUTED TO	3	6.62	1	2772.	544.	210.	136.	65.	40.	29.	17.	6.
		(17.15)		(78.49)(	15.41)(	5.95)(	3.85)(	1.83)(	1.14)(	.82)(	.49)(	.16)
ROUTED TO	4	6.62	1	2768.	544.	210.	136.	65.	40.	29.	17.	6.
		(17.15)		(78.39)(	15.41)(	5.95)(	3.85)(	1.83)(	1.14)(	.82)(	.49)(	.16)
ROUTED TO	5	6.62	1	2766.	544.	210.	136.	65.	40.	29.	17.	6.
		(17.15)		(78.34)(	15.41)(	5.94)(	3.84)(	1.83)(	1.14)(	.82)(	.49)(	.16)
HYDROGRAPH AT	5	7.60	1	13276.	6638.	2655.	1991.	1328.	929.	664.	398.	133.
		(19.68)		(375.95)(	187.97)(	75.19)(	56.39)(	37.59)(	26.32)(	18.80)(	11.28)(	3.76)
2 COMBINED	5	14.22	1	13639.	6724.	2678.	2009.	1339.	937.	670.	402.	134.
		(36.83)		(386.21)(	190.40)(	75.84)(	56.88)(	37.92)(	26.54)(	18.96)(	11.38)(	3.79)
ROUTED TO	6	14.22	1	13641.	6722.	2675.	2006.	1330.	923.	647.	372.	116.
		(36.83)		(386.26)(	190.36)(	75.74)(	56.80)(	37.66)(	26.13)(	18.32)(	10.54)(	3.30)

C-20

SUMMARY OF DAM SAFETY ANALYSIS

HARVEYS LAKE DAM

B

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1255.00	1255.00	1260.80
STORAGE	23856.	23856.	27824.
OUTFLOW	0.	0.	591.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1263.60	2.80	29880.	2773.	32.50	48.75	0.00
.50	1259.92	0.00	27201.	544.	0.00	52.25	0.00
.20	1257.05	0.00	25228.	210.	0.00	52.50	0.00
.15	1256.57	0.00	24903.	136.	0.00	53.00	0.00
.10	1256.08	0.00	24573.	65.	0.00	54.25	0.00
.07	1255.76	0.00	24360.	40.	0.00	54.75	0.00
.05	1255.54	0.00	24216.	29.	0.00	54.75	0.00
.03	1255.33	0.00	24072.	17.	0.00	54.75	0.00
.01	1255.11	0.00	23928.	6.	0.00	54.75	0.00

PLAN 1 STATION 2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1.00	2772.	1255.0	48.75
.50	544.	1252.6	52.50
.20	210.	1251.7	52.50
.15	136.	1251.4	53.25
.10	65.	1251.1	54.50
.07	40.	1250.7	55.00
.05	29.	1250.5	55.00
.03	17.	1250.3	55.00
.01	6.	1250.1	55.00

PLAN 1 STATION 3

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1.00	2772.	1248.2	49.00
.50	544.	1243.7	52.50
.20	210.	1242.3	52.75
.15	136.	1241.8	53.25
.10	65.	1241.2	54.75
.07	40.	1240.8	55.50
.05	29.	1240.6	55.50
.03	17.	1240.4	55.50
.01	6.	1240.1	55.25

PLAN 1 STATION 4

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS

1.00	2768.	1157.7	49.25
.50	544.	1155.2	53.00
.20	210.	1154.4	53.25
.15	136.	1154.0	54.00
.10	65.	1153.5	55.25
.07	40.	1153.3	56.00
.05	29.	1153.2	56.00
.03	17.	1153.1	56.00
.01	6.	1153.0	56.00

PLAN 1 STATION 5

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
1.00	2766.	1123.9	49.25
.50	544.	1121.5	53.25
.20	210.	1120.8	53.75
.15	136.	1120.5	54.75
.10	65.	1120.3	56.00
.07	40.	1120.2	56.75
.05	29.	1120.1	56.75
.03	17.	1120.1	56.75
.01	6.	1120.0	56.50

SUMMARY OF DAM SAFETY ANALYSIS

BRYANT POND DAM

B

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1104.70	1104.70	1106.70
STORAGE	83.	83.	120.
OUTFLOW	0.	0.	285.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1113.02	6.32	257.	13641.	43.75	41.75	0.00
.50	1111.12	4.42	213.	6722.	41.25	41.75	0.00
.20	1109.59	2.89	179.	2675.	21.25	41.75	0.00
.15	1109.24	2.54	172.	2006.	17.00	41.75	0.00
.10	1108.76	2.06	162.	1330.	12.75	42.00	0.00
.07	1108.24	1.54	151.	923.	10.25	42.25	0.00
.05	1107.78	1.08	141.	647.	7.75	42.50	0.00
.03	1107.04	.34	127.	372.	3.75	43.00	0.00
.01	1105.84	0.00	104.	116.	0.00	43.25	0.00

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
**********
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```
    1              A1                                NATIONAL DAM INSPECTION  PROGRAM
    2              A2                                        HARVEYS CREEK
    3              A3                                        BRYANT POND DAM
    4              B     300        0        6        0        0        0        0        0       -4        0
    5              B1      5
    6              J       2        2        1
    7              J1    .50      .03
    8              K       0        1                                                  1
    9              K1       RUNOFF INTO HARVEYS LAKE
   10              M       1        1     6.62                14.22                                    1
   11              P               21.7      114      123      133
   12              T                                                          1.0      .05                .16
   13              W    1.39      .30
   14              X    -1.5    -0.05      2.0
   15              K       1        1                                                  1
   16              K1       ROUTE THROUGH HARVEYS LAKE (OUTLET COMB OF DAM & ROADWAY)
   17              Y                                         1        1
   18              Y1      1                                                      -1255       -1
   19              Y4   1255     1256     1257     1258     1259     1260     1261     1262     1263     1264
   20              Y5      0       53      198      422      491      549      601      649      694      736
   21              $A      0      659      702     1020
   22              $E1146.4     1255     1260     1280
   23              $B   1255
   24              $D1260.8
   25              $L      1       55       90      160      300      300
   26              $V1260.8  1260.9  1261.7  1261.9  1263.5     1270
   27              $B     10        C     1250       .1     1255     1279
   28              $B     10        0     1250       .1     1255     1279
   29              K       1        2                                                  1
   30              K1       ROUTE  OUTFLOW HARVEYS LAKE  SECT 2
   31              Y                                         1        1
   32              Y1      1                                                      -1
   33              Y6    .09      .07      .09     1250     1270     1200   .00833
   34              Y7      0     1400      500     1300      650     1260      940     1250      950     1250
   35              Y7   1220     1260     1490     1300     1990     1400
   36              K       1        3                                                  1
   37              K1       ROUTE OUTFLOW HARVEYS LAKE SECT 3
   38              Y                                         1        1
   39              Y1      1                                                      -1
   40              Y6    .09      .07      .09     1240     1260     2850    .0105
   41              Y7      0     1400      350     1300      420     1260      490     1240      510     1240
   42              Y7    600     1260      750     1300     1090     1400
   43              K       1        4                                                  1
   44              K1       ROUTE OUTFLOW HARVEYS LAKE SECT 4
   45              Y                                         1        1
   46              Y1      1                                                      -1
   47              Y6    .09      .07      .09     1153     1180     5850     .016
   48              Y7      0     1260      400     1180      500     1160      600     1153      630     1153
   49              Y7    760     1160      840     1180     1300     1260
   50              K       1        5                                                  1
```

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```
51    K1      ROUTE OUTFLOW HARVEYS LAKE SECT 5
52    Y                                    1       1
53    Y1    1                                                    -1
54    Y6   .09     .07     .09    1120    1140    4500   .0125
55    Y7    0    1200     200    1160     280    1140     400    1120     500    1120
56    Y7  780    1140     920    1160    1200    1200
57    K     0       5                                           1
58    K1      UNCONTROLLED RUNOFF INTO BRYANT POND
59    M     1       1     7.6           14.22                                 1
60    P           21.7     114     123     133
61    T                                                        1.0     .05
62    W   1.54    0.30
63    X   -1.5   -0.05     2.0
64    K     2       5
65    K1      COMBINE INFLOW TO BRYANT POND
66    K     1       6                                           1
67    K1      ROUTE THROUGH BRYANT POND
68    Y                                    1       1
69    Y1    1                                                -1104.7    -1
70    Y41104.7  1105.3  1106.4  1107.1  1107.8  1109.1  1110.5  1114.7  1117.4  1125.7
71    Y5    0      25     213     381     580    1053    1611    3699    5381   11539
72    SA    0      18      30
73    SE1090.9  1104.7    1120
74    SS1104.7
75    SD1106.7
76    SL    1      62      77     118     206     340     365     365
77    SV1106.7  1107.9  1108.3  1108.6  1108.7    1109    1111    1120
78    SB   60       0    1093      .1  1104.7    1119
79    SB   60       0    1093      .1  1104.7    1107
80    K     1       7                                           1
81    K1      ROUTE TO DAMAGE CENTER
82    Y                                    1       1
83    Y1    1                                                    -1
84    Y6   .09     .07     .09    1089    1120    2400  .00285
85    Y7    0    1200     550    1140     650    1100     700    1089     750    1089
86    Y7  800    1100    1400    1120    1600    1160
87    K    99
```

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PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .50	RATIO 2 .03
HYDROGRAPH AT	1	6.62	1	6101.	366.
	(	17.15)	(	172.77)(	10.37)(
			2	6101.	366.
			(	172.77)(	10.37)(
ROUTED TO	1	6.62	1	526.	16.
	(	17.15)	(	14.88)(	.45)(
			2	526.	16.
			(	14.88)(	.45)(
ROUTED TO	2	6.62	1	526.	16.
	(	17.15)	(	14.88)(	.45)(
			2	526.	16.
			(	14.88)(	.45)(
ROUTED TO	3	6.62	1	525.	16.
	(	17.15)	(	14.88)(	.45)(
			2	525.	16.
			(	14.88)(	.45)(
ROUTED TO	4	6.62	1	525.	16.
	(	17.15)	(	14.87)(	.45)(
			2	525.	16.
			(	14.87)(	.45)(
ROUTED TO	5	6.62	1	525.	16.
	(	17.15)	(	14.87)(	.45)(
			2	525.	16.
			(	14.87)(	.45)(
HYDROGRAPH AT	5	7.60	1	6616.	397.
	(	19.68)	(	187.34)(	11.24)(
			2	6616.	397.
			(	187.34)(	11.24)(
2 COMBINED	5	14.22	1	6676.	400.
	(	36.83)	(	189.05)(	11.32)(
			2	6676.	400.
			(	189.05)(	11.32)(
ROUTED TO	6	14.22	1	6675.	371.
	(	36.83)	(	189.02)(	10.49)(
			2	8359.	8244.
			(	236.71)(	233.44)(
ROUTED TO	7	14.22	1	6672.	369.
	(	36.83)	(	188.94)(	10.45)(

A

2	6658.	4809.
(	188.55)(	136.16)(

SUMMARY OF DAM SAFETY ANALYSIS

HARVEYS LAKE DAM

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1255.00	1255.00	1260.80
STORAGE	23856.	23856.	27824.
OUTFLOW	0.	0.	591.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50	1259.60	0.00	26974.	526.	0.00	25.80	0.00
.03	1255.30	0.00	24054.	16.	0.00	26.90	0.00

PLAN 2 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1255.00	1255.00	1260.80
STORAGE	23856.	23856.	27824.
OUTFLOW	0.	0.	591.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50	1259.60	0.00	26974.	526.	0.00	25.80	0.00
.03	1255.30	0.00	24054.	16.	0.00	26.90	0.00

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PLAN 1 STATION 2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	526.	1252.5	25.90
.03	16.	1250.3	27.20

PLAN 2 STATION 2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	526.	1252.5	25.90
.03	16.	1250.3	27.20

PLAN 1 STATION 3

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	525.	1243.7	26.10
.03	16.	1240.3	27.60

PLAN 2 STATION 3

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	525.	1243.7	26.10
.03	16.	1240.3	27.60

PLAN 1 STATION 4

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	525.	1155.1	26.60
.03	16.	1153.1	28.40

PLAN 2 STATION 4

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	525.	1155.1	26.60
.03	16.	1153.1	28.40

PLAN 1 STATION 5

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	525.	1121.5	26.90
.03	16.	1120.1	29.00

PLAN 2 STATION 5

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	525.	1121.5	26.90
.03	16.	1120.1	29.00

SUMMARY OF DAM SAFETY ANALYSIS

BRYANT POND DAM

A

PLAN 1 ••••••••••••••••

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1104.70	1104.70	1106.70
STORAGE	83.	83.	120.
OUTFLOW	0.	0.	285.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50	1111.11	4.41	213.	6675.	17.70	17.60	0.00
.03	1107.04	.34	127.	371.	3.80	18.90	0.00

PLAN 2 ••••••••••••••••

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1104.70	1104.70	1106.70
STORAGE	83.	83.	120.
OUTFLOW	0.	0.	285.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50	1107.03	.33	127.	8359.	.65	13.00	12.90
.03	1107.00	.30	126.	8244.	1.15	18.40	18.30

PLAN 1 STATION 7

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	6672.	1101.7	17.70
.03	369.	1091.8	19.10

PLAN 2 STATION 7

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	6658.	1101.7	18.00
.03	4809.	1100.1	18.50

GANNETT FLEMING CORDDRY
AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT _____ FILE NO. _____
SHEET NO. ____ OF ____ SHEETS
FOR _____
COMPUTED BY _____ DATE _____ CHECKED BY _____ DATE _____

TABLE OF PERTINENT RESULTS

PMF RAINFALL = 25.02"

	PMF	½ PMF
RUNOFF (INCHES - APPROXIMATE)	22.4	11.2
HARVEY'S LAKE DAM		
INFLOW - CFS	12,340	6,170
OUTFLOW - CFS	2,773	544
BRYANT POND DAM		
INFLOW - CFS	13,639	6,724
OUTFLOW - CFS	13,641	6,722
DEPTH OF OVERTOPPING (FT)	6.32	4.42
DURATION OF OVERTOPPING (HRS)	43.75	41.25

BREACH DATA

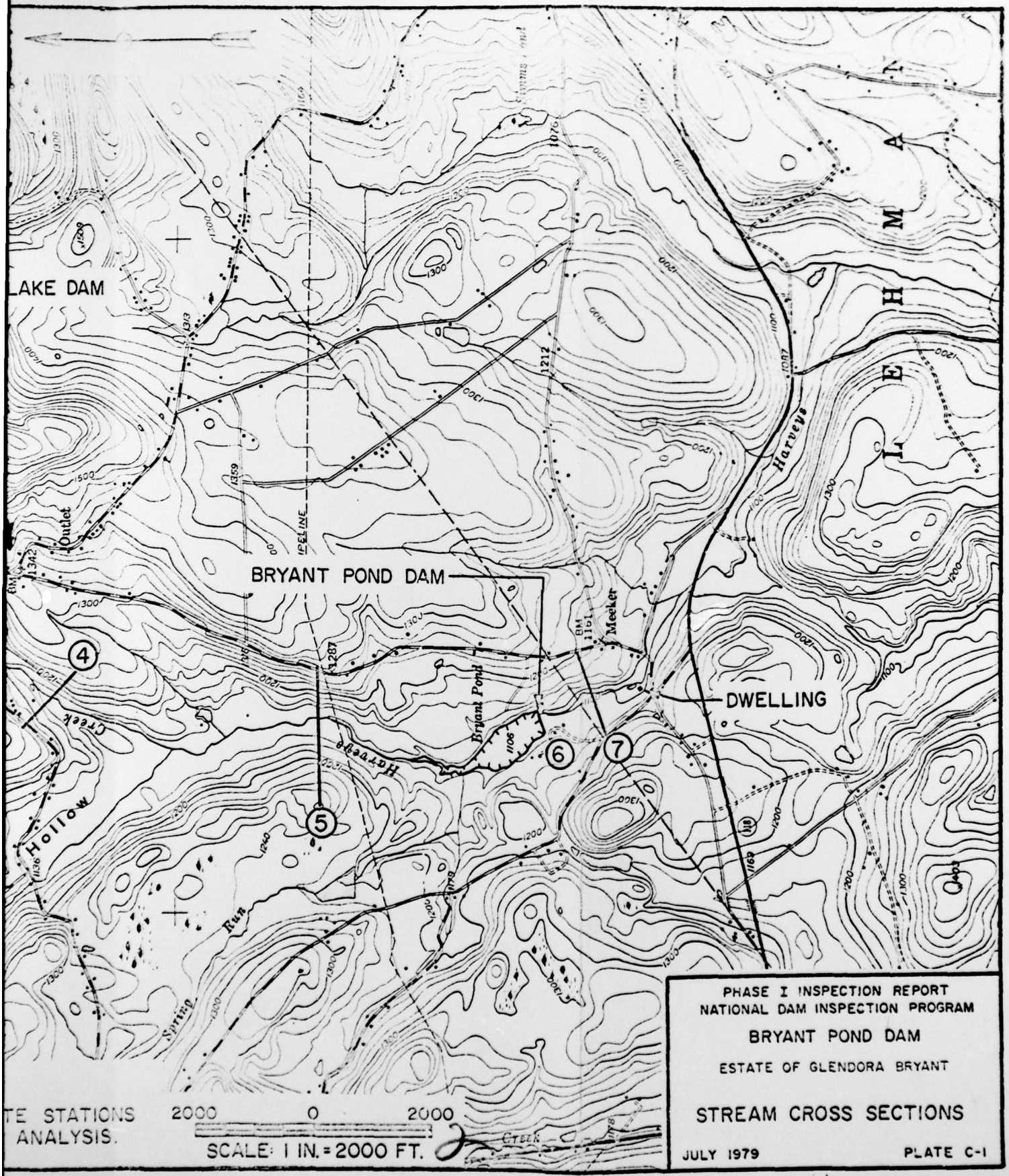
BREACH RESULTS IN PEAK OUTFLOW OF 8300 CFS IN EACH CASE

WATER SURFACE ELEV AT DOWNSTREAM SECTION

	No Failure	Dam Breach
50% PMF	1101.7	1101.7
3% PMF	1091.8	1100.1

6513


HARVEYS LAKE
HARVEYS LAKE DAM
1
2
3
4
Laketon
Outlet
Shawanese
Kocher Cem.
Hollow
Run
Spring
Creek
BM 1342
1255
1274
1313
1359
1331
1138
NOTE:
NUMBERS INDICATE STATIONS USED IN COMPUTER ANALYSIS.
2000
SCALE:



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

BRYANT POND DAM

ESTATE OF GLENDORA BRYANT

STREAM CROSS SECTIONS

JULY 1979

PLATE C-1

TE STATIONS
ANALYSIS.

SUSQUEHANNA RIVER BASIN

HARVEYS CREEK, LUZERNE COUNTY

PENNSYLVANIA

BRYANT POND DAM

NDI ID No. PA-00544
DER ID No. 40-11

ESTATE OF GLENDORA BRYANT

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

JULY 1979

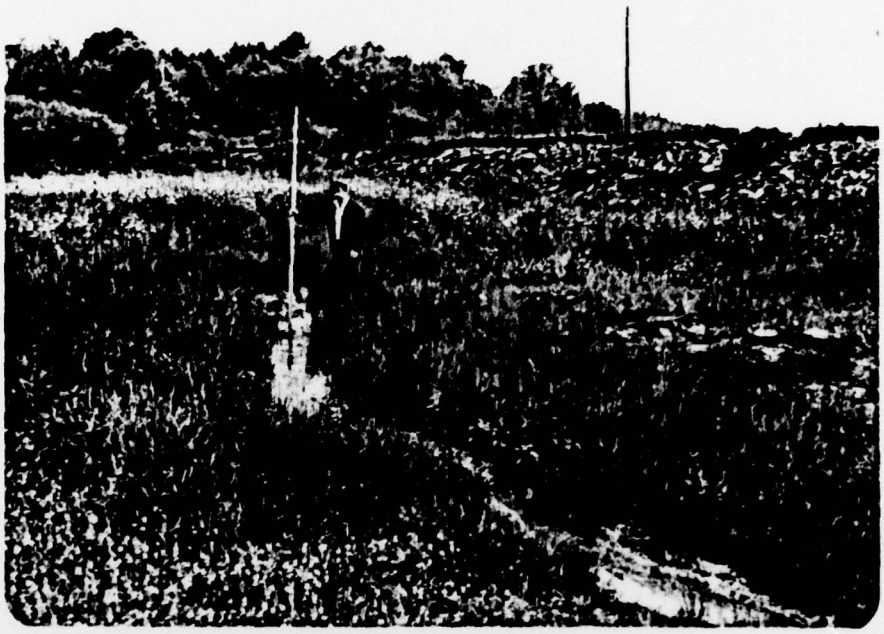
APPENDIX D

PHOTOGRAPHS

BRYANT POND DAM

A. Top of Dam

B. Upstream Slope

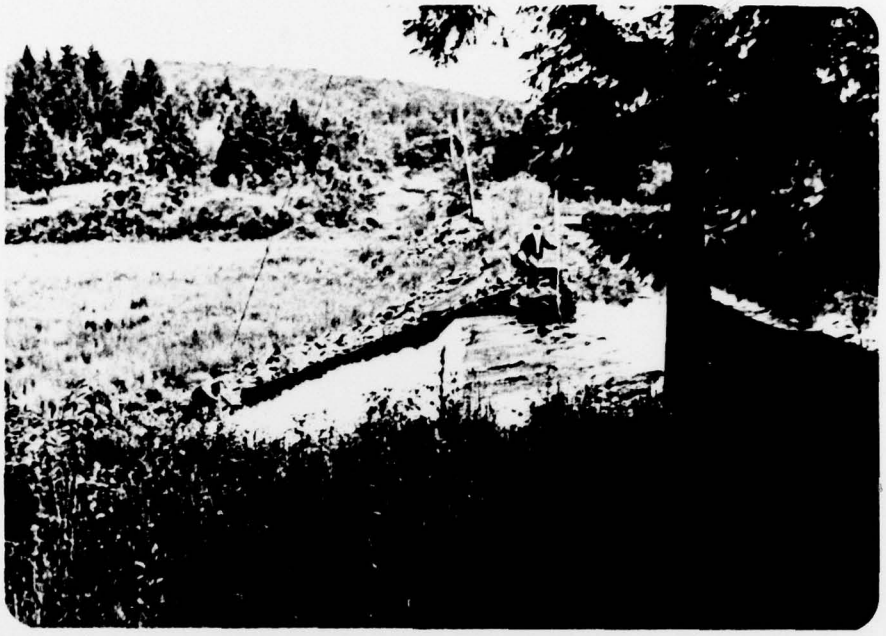


C. Downstream Slope and Seepage

D. Washout Near Ice Chute

E. Breach Area

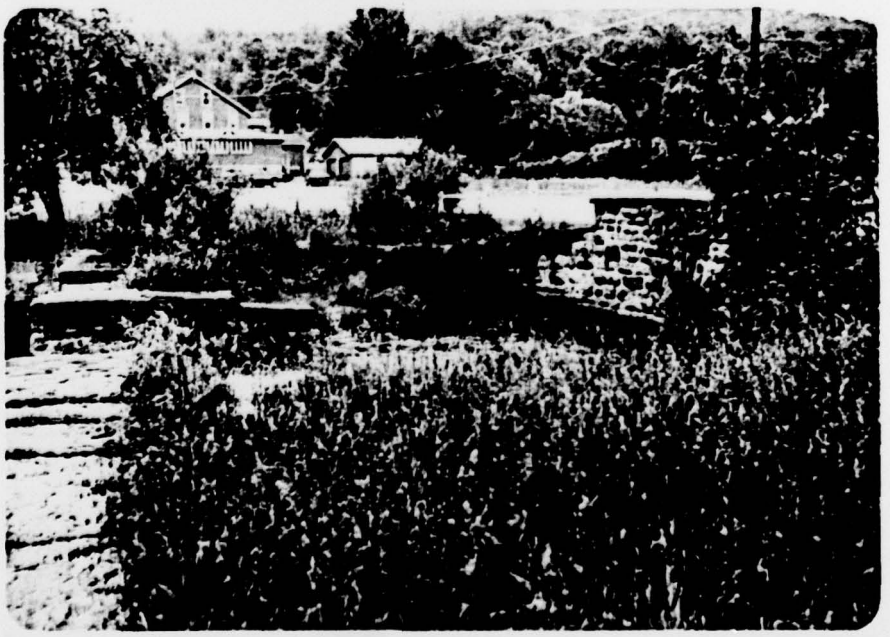
F. Breach Area



G. Spillway

H. Spillway

I. Outlet Works



J. Harveys Lake Dam -
Upstream From Bryant Pond Dam

SUSQUEHANNA RIVER BASIN

HARVEYS CREEK, LUZERNE COUNTY

PENNSYLVANIA

BRYANT POND DAM

NDI ID No. PA-00544
DER ID No. 40-11

ESTATE OF GLENDORA BRYANT

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

JULY 1979

APPENDIX E

GEOLOGY

BRYANT POND DAM

APPENDIX E

GEOLOGY

1. General Geology. The damsite and reservoir are located in Luzerne County. The rock formations exposed in Luzerne County range from the Post-Pottsville formations, of Pennsylvanian Age, down to the Onondaga formation, of Middle Devonian Age. The Wisconsin terminal moraine crosses the southern part of the County, and the greater part of the County is covered by glacial drift. Extensive deposits of glacial outwash occur along the Susquehanna River and less extensive deposits along the smaller streams.

Nearly all of Luzerne County lies in the Valley and Ridge Province in which nearly all the rocks have been strongly folded. In going from north to south across the County, five major folds are encountered, all of which trend northeast. The first of these is a shallow syncline on the crest of North Mountain, forming the Mehoopnay coal basin. The second is the Milton Anticline, which exposes the Portage group in the northwestern part of the County and gradually flattens out toward the northeast. The third and most pronounced is the Lackawanna Syncline, which originates in Lackawanna County to the north, and has preserved the post-Pottsville formations throughout the Wyoming Valley. The maximum depth of this syncline is reached in the vicinity of Wilkes-Barre and Plymouth. The double rim of this syncline is formed by the resistant Pottsville formation and Pocono sandstone, separated by the less resistant Mauch Chunk shale. The fourth fold is the Berwick (Montour) Anticline, which exposes a few feet of the Onondaga formation in the vicinity of Beach Haven. This fold reaches its maximum development farther west and only the eastern portion reaches Luzerne County. The fifth major fold comprises a series of anticlines and synclines forming the Eastern Middle Anthracite Field in the vicinity of Hazleton. The synclinal basins in this region are relatively shallow and there are large areas from which all coalbeds have been eroded.

The general dips of the region vary from 0° to 40°, and the maximum dips are found on the rims and within the synclinal coal basins. The relatively soft Post-Pottsville beds in their cores are severely folded and contorted with numerous minor faults. The northern and easternmost parts of the County border the Appalachian Plateau Province and are characterized by horizontal, or nearly horizontal strata. The Catskill continental group of rocks underlies those parts of Luzerne County that are outside of the five major folds.

2. Site Geology. Bryant Pond Dam is situated on an "uncertain foundation" of the Catskill formation of late Devonian Age. The Catskill formation is composed of red shale, red and gray crossbedded sandstone, white sandstone, and gray shale and sandstone. This formation underlies the county and crops out north and south of the Wyoming Valley. Crossbedding, channeling, and cut-and-fill features are common to the sandstone and conglomerate units. Bedding is usually well developed with thicknesses ranging from less than one foot to 10 to 16 feet in the coarser beds. Shales of this formation tend to air-slake. Sandstones and conglomerates are moderately resistant to weathering.

Information concerning the actual foundation conditions is scant. The original owner reported to the Pennsylvania Water Supply Commission that the concrete core-wall was founded on either "rock or hardpan".


WYOMING CO.
POCONO FORMATION
HARVEYS LAKE
LAKE
DALLAS
Dallas
BRYANT POND DAM
ROSS
PA 118
LEHMAN
Sweet Valley
CATSKILL FORMATION
JACKSON
Sylvan Lake
Lake Silkworth
PA 29
POTTSVILLE FORMATION
PLYMOUTH
Plymouth
HUNLOCK
West Nanticoke
RIVER
MARINE BEDS
US 11
Nanticoke
HANOVE
SUSQUEHANNA
Cr
LLEWELLYN FORMATION
MAUCH CHUNK FORMATION
Espy
Glen Lyon
Newport
NEWPORT
CONYNGHAM
Pl
Pp
Mmc
SCALE: 1 IN. = 2 MILES
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
BRYANT POND DAM
ESTATE OF GLENDORA BRYANT
GEOLOGIC MAP
JULY 1979
PLATE E-1